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Identificateur(s) de sujet: *Infirme moteur cérébral *Matériel de communication *Evaluation du matériel

Le document présente les résultats d'une analyse de divers médiateurs électroniques visant à favoriser la communication chez des enfants souffrant de troubles moteurs cérébraux et incapables de parler et/ou d'écrire. Une quinzaine d'appareils sont appréciés à l'aide d'une grille d'évaluation abordant les points suivants: distributeur, description générale, système de commande, mode de fonctionnement, output, feedback, auto-correction, maniabilité, dimension, poids, accessibilité, coût, particularités. Des tirés à part provenant de matériels publicitaires accompagnent les données recueillies à l'aide de la grille.

Les principaux critères d'évaluation reposent sur une capacité potentielle du médiateur à permettre une expression véritablement autonome, tant au niveau de la pré-lecture qu'à d'autres phases de l'apprentissage ainsi que sur les possibilités d'utilisation dans un cadre pédagogique. D'autres aspects tels l'accessibilité, la simplicité d'opération, les possibilités de feedback et d'auto-correction ou le coût ont également retenu l'attention.

Type de document: r
Notice(s) connexe(s): 8270760
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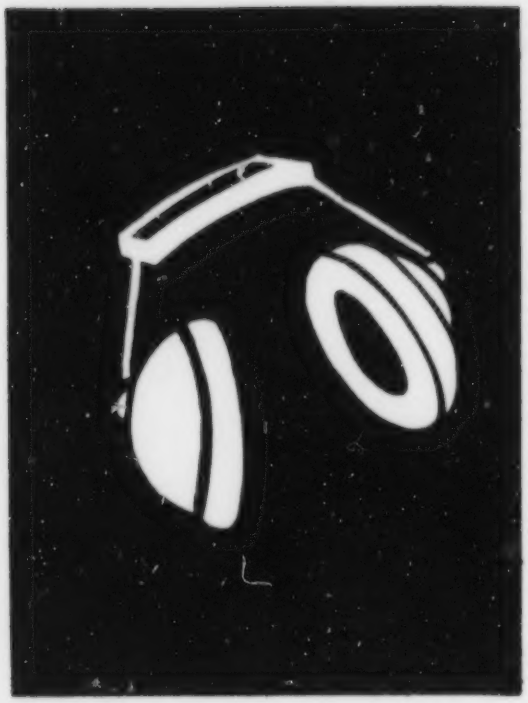
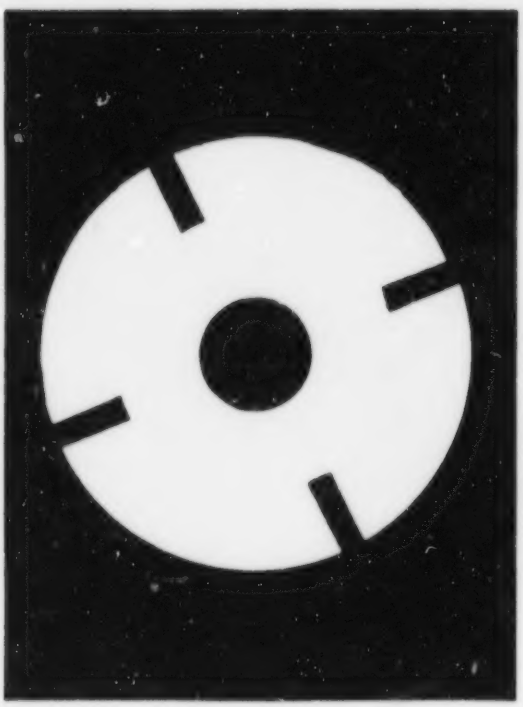
E D U Q 8270759



ANALYSE DE

DISPOSITIFS TECHNIQUES



FAVORISANT LA

COMMUNICATION

CHEZ LES I.M.C.

Camille Gratton
Louise Paré
Keila Waksvik

BUREAU DES RESSOURCES ORTHOPEDAGOGIQUES

DIVISION DES SERVICES SPECIAUX C.E.C.M.

Juillet 1976

E D U Q 8270759

ANALYSE DE DISPOSITIFS TECHNIQUES VISANT A FAVORISER LA COMMUNICATION CHEZ LES INFIRMES MOTEURS CEREBRAUX

Présenté par:

Camille Gratton, M.A. (éducation)

Louise Paré, B. Sp. (Enfance inadaptée)

Keila Waksvik, B.O.T.

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BIBLIOGRAPHIE.

I N T R O D U C T I O N

Comme le titre du projet l'indique, nous présentons dans ce document les résultats d'une analyse schématique des divers médiateurs électroniques visant à favoriser la communication chez les enfants incapables de parler et/ou d'écrire.

A la suite de correspondances et de recherches, nous avons recueilli une documentation assez complète, tout en considérant les limites imposées par le cadre du présent projet.

Afin d'effectuer une première sélection dans toute cette documentation, nous avons déterminé certains critères, à partir desquels nous avons conçu une grille d'évaluation. Cet instrument de travail nous a permis de procéder à une analyse comparative des équipements qui ont retenu notre attention.

Le premier critère d'évaluation repose sur une capacité potentielle du médiateur à rendre une expression véritablement autonome, tant au niveau de la pré-lecture qu'à d'autres phases de l'apprentissage, ainsi que sur les possibilités d'utilisation dans un cadre pédagogique. D'autres aspects, tels: l'accessibilité, la simplicité d'opération, les possibilités de feedback et d'auto-correction, le coût, etc... ont retenu tout autant notre attention et influencé notre sélection.

De plus, nous tenons à souligner que des rencontres avec des personnes directement impliquées dans des expérimentations de médiateurs nous ont grandement éclairés.

---

1 - Personnes rencontrées

M. J.R. Charbonneau, Dépt. du Génie Médical, C.N.R.C.

M- Richard Foulds, Director, Bio-medical Engineering Center Tufts New Englans Medical Center, Boston, Mass.

M. J. Raitzer, Trace Center, University of Wisconcin, Madison

M. I.J., Electrical Engineering Dept, University of Alberta, Canada.

CHAPITRE I

DISPOSITIFS NON RETENUS

Nous croyons nécessaire, bien que cela ne soit pas tout à fait conforme, de présenter immédiatement les divers dispositifs qui n'ont pas été retenus ainsi que de spécifier les raisons qui expliquent cette mise de côté.

Nous procéderons à une énumération des dispositifs que nous avons écartés pour chacune de ces raisons:

ne correspondent pas à nos objectifs:

insuffisance de l'information:

non disponibles sur le marché:

non accessibles (distance):

non adéquation du système de commande:

ne restituent pas suffisamment d'autonomie:

manquent de versatilité.

Voici donc la liste des dispositifs non retenus pour chacun de ces divers motifs:

1o <u>ne correspondent pas à nos objectifs</u>:

- les systèmes d'aide pour les communications téléphoniques:
- les systèmes d'aide pour le contrôle de l'environnement:
- les systèmes d'aide pour les sourds:
- les systèmes d'aide pour l'enseignement (exemple: Logo)
- les aides dont nous disposons actuellement (exemple: une tige fixée à un bandeau autour de la tête pour le sujet qui ne peut pas dactylographier avec ses doigts, cette tige est appelée "licorne" dans notre milieu)

2o insuffisance de l'information:

certains dispositifs sont mis de côté, pour l'instant, parce que nous n'avons pas obtenus de réponse aux diverses demandes de renseignements supplémentaires que nous avons formulées. C'est le cas de:

a) "Alpha-Numeric Read-Out Word Display" (ANROWD):

The PHARCO Society
University of Saskatchewan
Saskatoon, Saskatchewan

b) "Possum Controls":

Possum Controls, Ltd,
63 Mandeville Rd,
Aylesbury, Buch.
England.

3o ne sont pas disponibles sur le marché:

a) "Communication Terminal for the Loss of Speech Handicapped":

H.C. Logan,
Napierville, Louisiana

b) "England Typewriter Keyboard":

University of New Orleans
Louisiana.

c) "Eye-controlled Teletypewriter":

N.A.S.A.
Hampton, Virginia.

d) "Talking Typewriter-Voice Synthetiser":

Neiji, University,

Japan.

e) "Rotocom":

Trace Center,

Madison, Wisconsin.

4o ne sont pas accessibles à cause de la distance:

a) "Clock Face Selector":

Centre Industries,

New South Wales,

Australia.

b) "Pilot System"

Queen Mary's Hospital,

London, England

Note: Nous avons mis de côté une grande variété d'aides techniques provenant de:

Ricks Centralen

Göteborg, Sweden.

5o n'est pas adéquat pour la clientèle prévue:

"MC 6400"

Mc 6400 Medical,

Burlington, Mass.

Ce système d'encodage fonctionne à l'aide du code Morse et exige une très grande habileté manuelle.

6o ne permet pas suffisamment d'autonomie:

"Lightwriter"

Designers of Equipment for the Disabled,

Cambridge, England.

Cet appareil exige la présence d'un adulte lors de la communication puisqu'il n'y a pas de possibilité d'impression.

7o ne sont pas assez versatiles:

a) "Myocom"

University of Missouri,

Columbia, Missouri.

Ne permet que d'attirer l'attention d'un interlocuteur possible par un signal sonore et de répondre oui ou non.

b) "V.A.P.C. Communicator"

V.A. Prothesthetics Centre,

New York, New York.

Ce dispositif permet de produire qu'un minimum de messages pré-établis.

c) "Portaprinter"

Vendacom, Inc,

Brooklyn, New York.

d) "Viewcom"

Fairchild Hiller

Germantown, Marvland

Ces deux derniers médiateurs exigent la connaissance de l'alphabet et ne permettent pas un système individualisé pour l'enfant au stade de la pré-lecture.

Remarque: Nous avons retenu, à cause du grand intérêt soulevé, certains dispositifs qui ne seront disponibles que dans un an à trois environ. C'est le cas du "TIC" et de "l'AVTOCOM". De plus, deux autres dispositifs faisant l'objet présentement d'une expérimentation au Ontario Crippled Children's Centre, à Toronto, pourront être analysés ultérieurement selon notre grille. Ce sont des tableaux de symboles Bliss portatifs, le "100 * 100" et le "512", les deux fonctionnant par balayage, à systèmes de commande variés. Enfin, nous précisons que le "512" est muni d'une mémoire.

CHAPITRE II

ANALYSE DES DISPOSITIFS RETENUS

Les grilles d'analyse qui suivent présentent les dispositifs qui ont retenu plus particulièrement notre attention.

Nous avons regroupés les divers dispositifs selon les distributeurs et indiqués toutes les informations générales que nous croyons utiles à l'intérieur de chaque grille.

Appareils distribués par:

Prentke Romich Company

Rd. 2, Box 191,

Shreve, Ohio, 44676, U.S.A.

- "Message Selector"

- "Alphabet - Message Scanner"

- "Strips Printer"

- "Blissymbol Scanner"

- "Encoding Strip Printer"

- "Encoding T.V. Display".

NOM DE L'APPAREIL	"Message Selector"	
DISTRIBUTEUR	Prentke Romich Company, Rd 2, Box 191, Shreve, Ohio, 44676, U.S.A.	
DESCRIPTION GENERALE	C'est un dispositif électronique de balayage, portatif, permettant une disposition de 8 images, lettres, etc... sur un petit écran; une 9ième position permet un signal auditif.	
SYSTEME DE COMMANDE	Levier basculant	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque position est illuminée lors du balayage	
AUTO-CORRECTION		
MANIABILITE	Portatif	
DIMENSIONS	5" x 7" x 2¼"	
POIDS	2 livres	
ACCESSIBILITE	oui	
COUT	$ 135.00	
PARTICULARITES	- Vitesse de balayage réglable - Garantie de 2 ans.	

NOM DE L'APPAREIL	"Alphabet Message Scanner"	
DISTRIBUTEUR	Prentke Romich Company, Rd 2, Box 191, Shreve, Ohio, 44676, U.S.A.	
DESCRIPTION GENERALE	Semblable au "Message Selector" mais permet 42 positions (7 rangées x 6 colonnes) pour la disposition des lettres, chiffres et autres caractères. Une position est réservée pour un signal auditif.	
SYSTEME DE COMMANDE	Levier basculant	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque position est illuminée lors du balayage	
AUTO-CORRECTION		
VARIABILITE	Portatif	
DIMENSIONS	8½ x 5½ x 6 pouces	
POIDS	5 livres	
ACCESSIBILITE	oui	
COUT	$ 330.00	
PARTICULARITES	- surfaces interchangeables disponibles, ce qui permet un vocabulaire individualisé - les lettres sont organisées par ordre de fréquence dans la langue anglaise - vitesse de balayage réglable - on peut orienter le tableau à différents angles - permet un contrôle de différents appareils de l'environnement tel radio, lampes, etc. - garantie de 2 ans.	

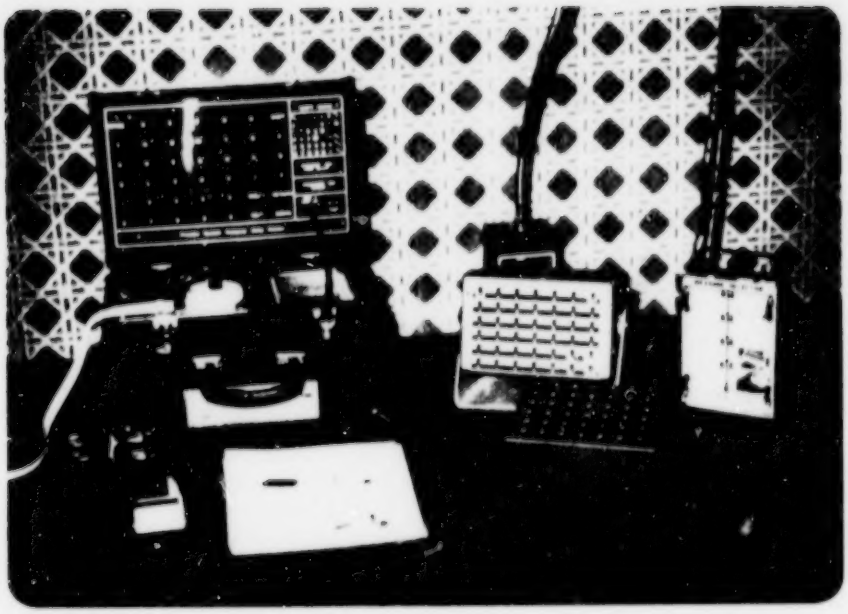
NOM DE L'APPAREIL	"Strip Printer"	
DISTRIBUTEUR	Prentke Romich Company Rd 2, Box 191, Shreve, Ohio 44676, U.S.A.	
DESCRIPTION GENERALE	Dispositif compact incorporé dans une malette permettant l'accès à 64 positions, fonctionnant par balayage. Il y a aussi un signal auditif. Un mince rouleau de papier est incorporé ce qui donne la possibilité d'imprimer des mots entiers, des phrases, etc... Ceci favorise une plus grande autonomie.	
SYSTEME DE COMMANDE	Levier basculant	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	x
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque position est illuminée lors du balayage chaque caractère est visible après impression	
AUTO-CORRECTION	Non	
MANIABILITE	Portatif	
DIMENSIONS	$14\frac{1}{2}$"x $8\frac{1}{2}$" x $9\frac{1}{2}$"	
POIDS	14 livres	
ACCESSIBILITE	Oui	
COUT	$ 890.00	
PARTICULARITES	- On peut magnifier les caractères imprimés à l'aide d'un dispositif supplémentaire ($20.00) - Vitesse de balayage réglable - Permet un contrôle de différents appareils de l'environnement tel radio, lampe, etc... - Garantie de 2 ans.	

Tiré-à-part: 1

"Message Selector"

"Alphabet-Message Scanner"

"Strip Printer"



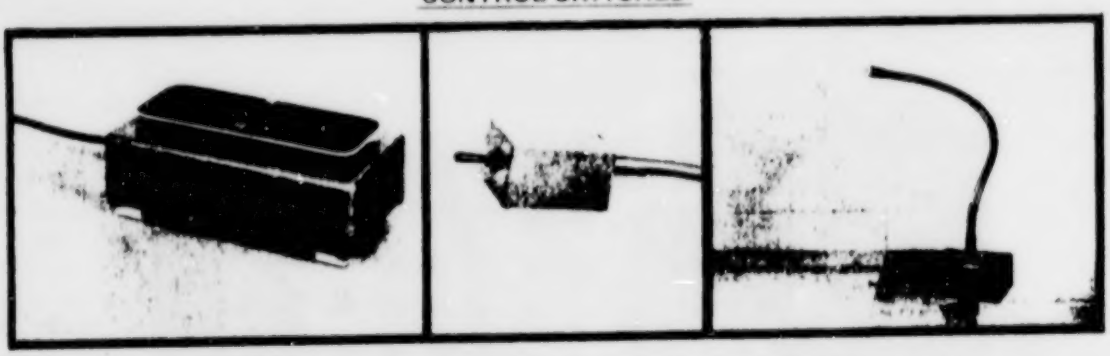
Prentke Romich Company

ELECTRONIC AIDS FOR THE SEVERELY HANDICAPPED

ELECTRONICS CENTER – R. D. 2, Box 191 – SHREVE, OHIO 44676 – (216) 567 2906

In 1966, Ed Prentke and Barry Romich began to design and build electronic aids for the handicapped. Since then, Prentke Romich Company has been developing a comprehensive line of devices with the goal of providing a basic desired function at an affordable price. After reviewing this information, we hope you'll agree with the many others who have acclaimed our success in meeting that goal. Prentke Romich Company devices have been procured by VA and civilian hospitals, rehabilitation centers, universities, schools, state rehabilitation departments and individuals across the nation and are providing a higher level of independence to quadriplegics, amputees, the severely communicatively handicapped, and victims of stroke, multiple sclerosis, muscular dystrophy, cerebral palsy and similar disabilities. Please consider persons in your care or in your community who could benefit from the devices and service available from Prentke Romich Company.

CONTROL SWITCHES



All Prentke Romich Company devices can be controlled using a single (-1) or a dual (-2) momentary switch. The three standard styles of control switch offered are the Rocking Lever, the Tongue Switch and the Pneumatic Switch. The RL switch requires approximately 30 grams (1 oz.) of force and can be actuated using movement of some part of the body (head, chin, shoulder, arm, etc.) or with a mouth stick. The Pneumatic Switch requires a pressure or vacuum corresponding to about 4 cm. (1½") of water. All switches are provided with a connector that will plug into the device being controlled. All devices requiring a control switch are normally provided with (and the price includes) a rocking lever switch. Substitution will be made upon request with a corresponding price adjustment.

RL - 1 $27	TS - 1 $43	PS - 1 $64
RL - 2 $32	TS - 2 $48	PS - 2 $74

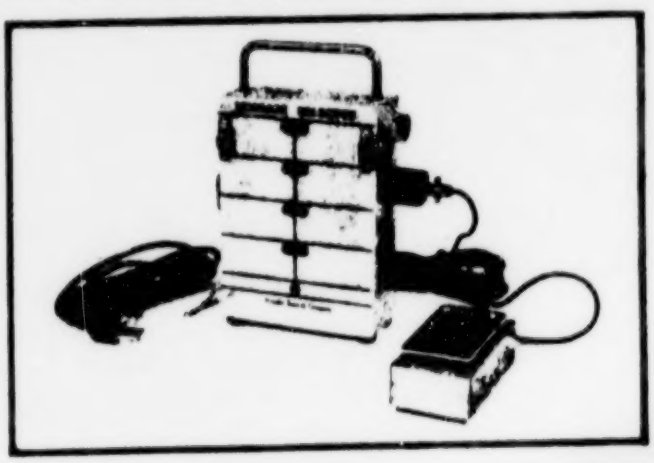
NON-VERBAL COMMUNICATION AIDS

The three basic approaches to non-verbal communication aids are scanning, encoding and direct selection. Of these three, the scanning technique requires the least control ability on the part of the user. Prentke Romich Company has developed and is manufacturing three scanning communication aids to fill a wide spectrum of needs. The Message Selector, Alphabet Message Scanner and Strip Printer are portable, rechargeable battery powered electronic devices that can be operated using a single momentary plug-in control switch. In addition to the rocking lever switch, each device is provided with a separate charging cord to permit overnight recharging of the batteries.

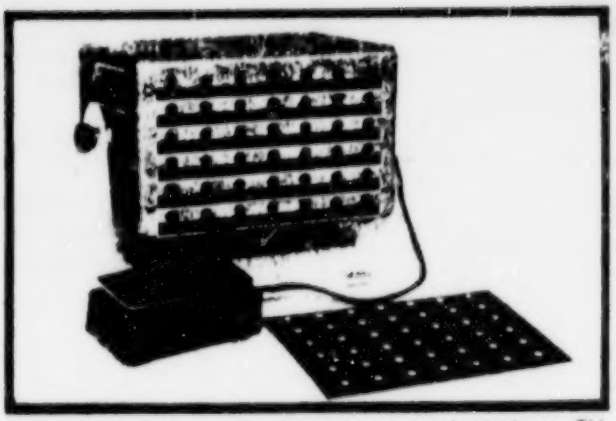
MESSAGE SELECTOR

The Message Selector is a simple scanning device. The white plastic panel contains eight spaces suitable for printing words or messages or drawing or attaching Bliss symbols or pictures. A small lamp corresponds to each space. Every time the user activates the control switch the light will step to the next location. If the switch is maintained, the light will continue to step at an adjustable rate until the switch is released. A ninth lamp indicates an audible signal location to permit the user to call for attention. The small size and light weight make the device easily portable. The unit measures 5" W x 7" H x 2¼" D and weighs 2 lb.

MS - 1 $135

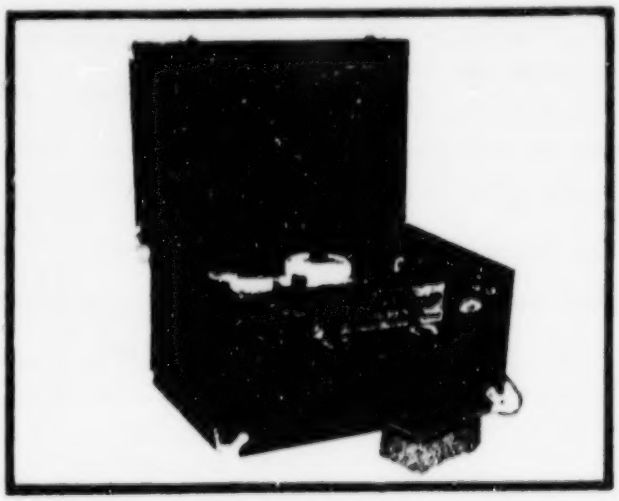


ALPHABET MESSAGE SCANNER



The Alphabet Message Scanner has 42 lamps arranged in a matrix of six rows and seven columns. Each lamp corresponds to a letter, number or other legend on the panel. The characters are organized approximately such that those easiest to select are most frequently used in English literary text. A display mask is provided to cover the panel and permit the use of words, pictures or Bliss symbols. Additional masks can be made or obtained as vocabulary increases. A particular lamp is turned on using the control switch by first scanning to the correct row, then scanning across that row to the desired lamp. The person receiving the communication would ignore the display until the control switch has been released the second time indicating completion of the selection. One lamp indicates a signal tone for calling for attention. A connector on the back permits the user to control telephone, TV, radio, lamps, microfilm reader, intercom, electric bed, nurse call, etc. using the Environmental Control Unit ECU-1. The cabinet measures 8"W x 5½"H x 6"D, weighs 5 lbs. and is provided with a stand to permit tilting for convenient observation. AMS-2 $330

STRIP PRINTER



The Strip Printer is a fully independent portable communication aid. It has an Alphabet-Message Scanner display built into the lid of the carrying case which houses a printing mechanism. When a lamp on the display has been selected, the corresponding character is automatically printed on a strip of pressure sensitive paper (no ink ribbon required). Operation is silent except for the impact required to print. A shift mode expands the number of characters that can be printed to 64. One lamp indicates a signal tone for calling for attention. A connector on the back permits the user to control telephone, TV, radio, lamps, microfilm reader, intercom, electric bed, nurse call, etc. using the Environmental Control Unit ECU-1. The closed case measures 14⅛" W x 8¾"H x 9½"D and weighs 14 lbs. SP-1 $890. An optional lighted magnifier enlarges the image of the printed characters, requires AC power and costs $20.

INFORMATION

Additional information on other aids and techniques for the severly communicatively handicapped may be obtained from

Director, Information and Training
Trace Center
University of Wisconsin
922 ERB, 1500 Johnson Drive
Madison, Wisconsin 53706.

ENVIRONMENTAL CONTROL

In addition to non-verbal communication aids, Prentke Romich Company offers two environmental control systems and related devices. They permit a person who can activate a single or dual control switch to use various electrical devices in his home or hospital surroundings. With the Automatic Dialing Telephone he can answer incoming calls and dial any number himself, even during a power failure. The systems also permit the control of TV, radio, lamps, intercom, tape recorder, microfilm reader, nurse call, electric bed, etc. If interested, please request the brochure covering these systems.

DEVELOPMENT, MANUFACTURING AND INFORMATION SERVICES

In addition to the proven communication aids described here, we would like to suggest that you contact us relative to the development and manufacture of devices not otherwise available which could be useful to the physically handicapped.

We try to keep abreast of the latest developments in technical aids and are happy to share information through telephone inquires only.

TWO YEAR WARRANTY

Prentke Romich Company electronic aids are complex devices containing many components. In cases where repair has been necessary, Prentke Romich Company has earned a fine reputation for providing fast, efficient service. In the unlikely event of failure during the first two years of ownership, the device will be repaired or replaced without charge.

APPAREIL	"Blissymbol Scanner"	
DISTRIBUTEUR	Prentke Romich Co. Rd 2, Box 191, Shreve, Ohio 44676, U.S.A.	
DESCRIPTION GENERALE	Appareil électronique, composé d'une matrice de 10 x 10, fonctionnant par balayage ou encodage. Contient une mémoire de 40 positions, et permet un signal auditif.	
SYSTEME DE COMMANDE	Levier basculant, bouton, ou commande par ultra son.	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x (par rangée et colonne)
	Encolage	x
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	Mémoire de 40 positions
FEEDBACK	Visuel- chaque position est illuminée lors du balayage Auditif - un signal sonore accompagne chaque illumination	
AUTO-CORRECTION	Non-applicable	
MANIABILITE	Portatif	
DIMENSIONS	13" x 17" x 2"	
POIDS	6 livres	
ACCESSIBILITE	oui	
COUT	unité centrale avec levier basculant et bouton de commande - $ 425.00 - mode d'encodage - $ 165.00 mémoire - ? - commande ultra-son - $ 340.00	
PARTICULARITES	- Batterie rechargeable - Signal auditif réglable - Vitesse de balayage réglable - Surfaces interchangeables disponibles, ce qui permet un vocabulaire individualisé - Garantie de 2 ans - Un appareil semblable, ayant un potentiel pour un vocabulaire plus grand (512 positions) est en voie de développement.	

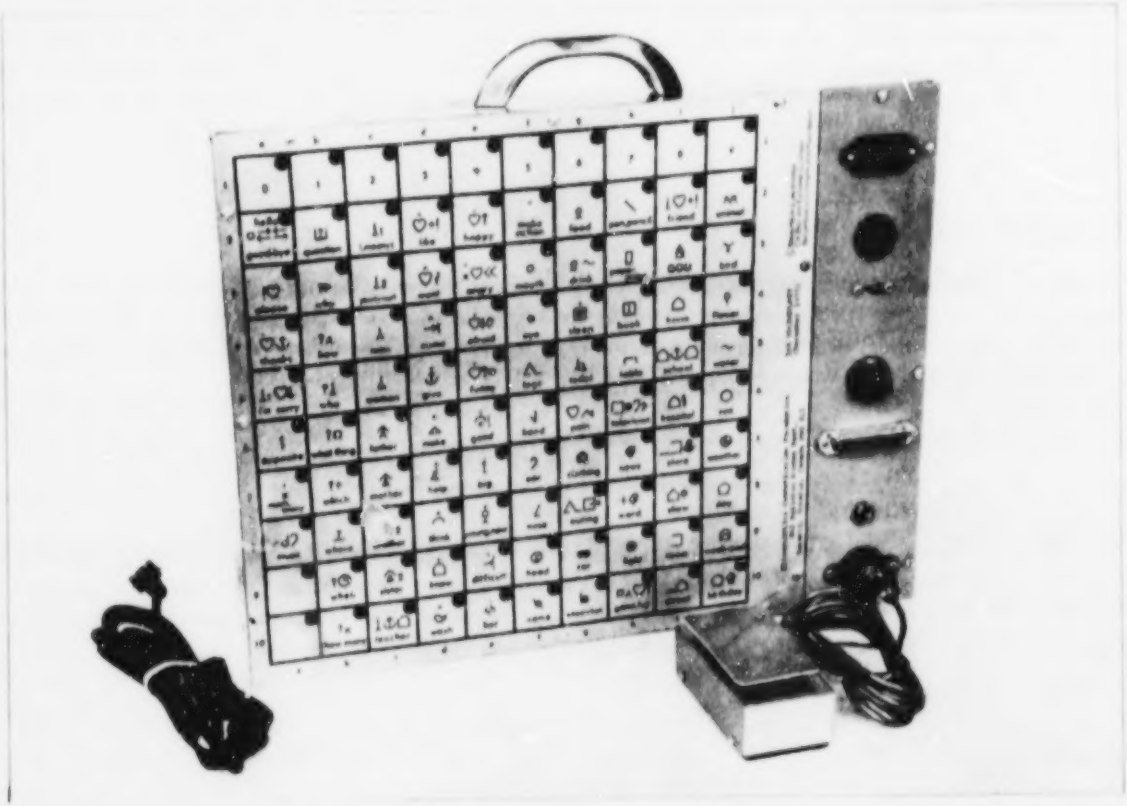
Tiré-à-part: 2

- "Blissymbol Scanner"

Prentke Romich Company

ELECTRONIC AIDS FOR THE SEVERELY HANDICAPPED

ELECTRONICS CENTER – R. D. 2, Box 191 – SHREVE, OHIO 44676 – (216) 567 - 2906



BLISS SYMBOL SCANNER

Prentke Romich Company is pleased to announce the addition of the 100 vocabulary Bliss Symbol Scanner BSS-100 to its line of scanning communication aids for the non-verbal physically handicapped. Each location on the display has a small lamp in the corner. Using a single momentary control switch or the pushbutton on the panel, the operator can select, by means of row-column scanning, any of the 100 locations. When a location has been selected by scanning down, then across, the lamp at that location will flash on and off until turned off. The scan rate is adjustable. An audible signal can be turned on to accompany each step. The same tone can be turned on by the user to request attention. The case measures 13"H x 17"W x 2"D and weighs under 6 lbs. The internal batteries can be recharged overnight using the charging cord provided. A plug-in rocking lever control switch is also included. An accessory connector permits the addition of an optional memory that can store up to 40 entries for rapid sequential display. An optional encoding adapter is also available. A white plastic coated display mask is included and can be used with a grease pencil to give each location any desired meaning.

BSS - 100: $425.

INFORMATION

Additional information on Bliss symbol communication may be obtained from

Blissymbolics Communication Foundation
862 Eglinton Avenue East
Toronto, Ontario, Canada M4G 2L1

ENCODING AIDS

For those who can activate several control switches, the encoding technique generally provides performance superior to that of scanning. To fill the need for low cost encoding aids, Prentke Romich Company is making both the Strip Printer and the Bliss symbol system available as encoding devices as well as an alpha-numeric television display.

ENCODING STRIP PRINTER

The Encoding Strip Printer ESP-1 will print one of 64 different characters (letters, numbers, etc.) after the user has activated one and then another of eight control switches. A small keyboard style switch is normally provided, but other switches could be used. The unit is portable with a built-in battery charger and separate charging cord. 12"W x 7"D x 5"H.

ESP-1: $750.

BLISS SYMBOL ENCODER

The Bliss Symbol Encoder BSE-100 is an auxiliary unit with a cable that will plug into the accessory connector on the Bliss Symbol Scanner BSS-100. Using ten control switches, the operator can sequentially select the row, then the column, containing the desired symbol. A small keyboard style switch is normally provided, but other switches could be used. Power is derived from the Bliss Symbol Scanner. 5"W x 5"D x 1"H.

BSE-100: $165.

ENCODING TELEVISION DISPLAY

The Encoding Television Display ETD-1 permits the display of letters, numbers and other characters on a television provided by the user. The screen will display eight lines of sixteen characters each. The user can display a character in the same manner as with the Encoding Strip Printer, using eight control switches. Another four switches will move the desired character location about the screen. With this system, characters already displayed can be erased or changed.

ETD-1: $810.

CONTROL SWITCH INTERFACE

In some cases, our standard control switches alone are inadequate for operating both the scanning and encoding aids. Work is in progress toward the goal of developing interfaces to better utilize the capabilities of those with handicapping upper extremity involvement. If a potential user is already proficient in the activation of a different control switch system, that system could be adapted to operate these devices.

TWO YEAR WARRANTY

Prentke Romich Company electronic aids are complex devices containing many components. In cases where repair has been necessary, Prentke Romich Company has earned a fine reputation for providing fast, efficient service. In the unlikely event of failure during the first two years of ownership, the device will be repaired or replaced without charge.

NOM DE L'APPAREIL	"Encoding Strip Printer"	
DISTRIBUTEUR	Prentke Romich, Rd 2, Box 191, Shreve, Ohio, 44676, U.S.A.	
DESCRIPTION GENERALE	Information pas disponible actuellement. Ressemble probablement au "Strip Printer" décrit à la page précédente.	
SYSTEME DE COMMANDE	Un petit panneau de commande avec 8 interrupteurs	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	
	Encolage	x
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	x
	Télévision	
	Autre	
FEEDBACK	Visuel - le caractère sélectionné est illuminé	
AUTO-CORRECTION	Non	
MAMIABILITE	Portatif	
DIMENSIONS	12" x 7" x 5"	
POIDS	information pas disponible actuellement	
ACCESSIBILITE	oui	
COUT	$ 750.00	
PARTICULARITES	- Batterie rechargeable - Garantie de 2 ans - Documentation plus complète non disponible actuellement.	

APPAREIL	"Encoding T.V. Display"
DISTRIBUTEUR	Prentke Romich Co. Rd 2, Box 191, Shreve, Ohio.
DESCRIPTION GENERALE	A l'aide d'un panneau de commande, le sujet sélectionne les lettres ou chiffres qui apparaissent ensuite sur un écran de télévision.
SYSTEME DE COMMANDE	Petit panneau avec plusieurs interrupteurs

MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	
	Encolage	x
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	x
	Autre	

FEEDBACK	Visuel - le caractère sélectionné est illuminé et est ensuite visible sur l'écran de télévision
AUTO-CORRECTION	oui
MANIABILITE	Amovible au besoin
DIMENSIONS	?
POIDS	?
ACCESSIBILITE	oui
COUT	$ 810.00
PARTICULARITES	- Grantie de 2 ans - Documentation plus complète non disponible actuellement.

Appareils distribués par:

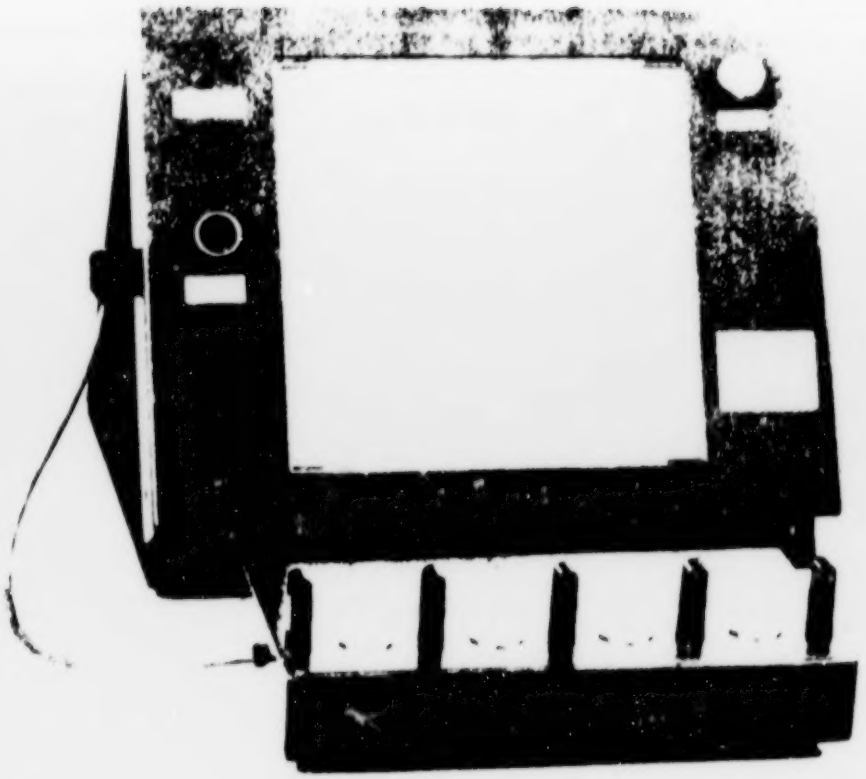
Dufco
901 Iva Court
Cambria, California,
U.S.A. 93428

- "Dufco Matrix Communicator - M.C. - 3M"

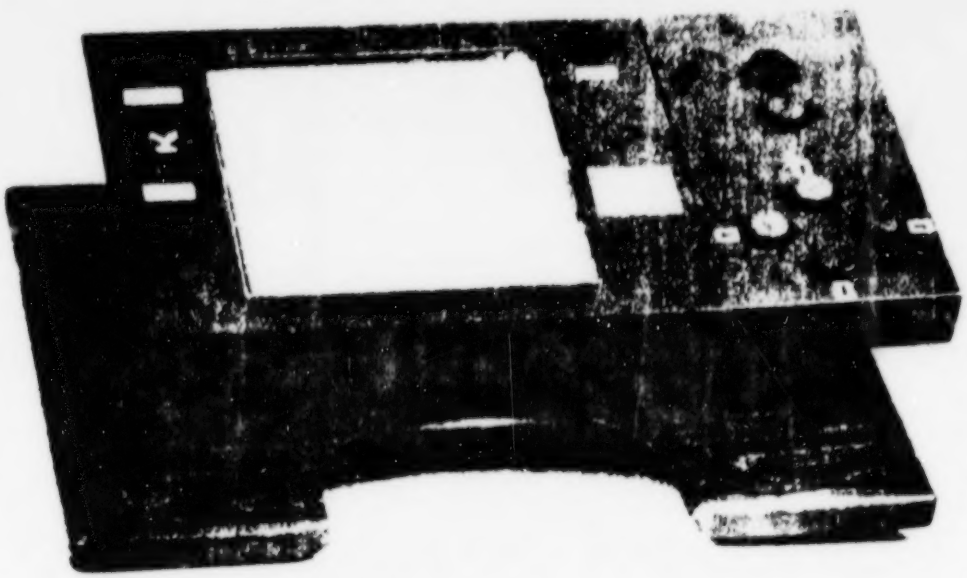
	"Dufco Matrix Communicator - MC - 3M"
DISTRIBUTEUR	Dufco 901 Iva Court Cambria, California, U.S.A. 93428
DESCRIPTION GENERALE	Dispositif compact, d'un maximum de 100 positions, avec surfaces interchangeables (pour la disposition d'images, symboles, lettres, ou mots).
SYSTEME DE COMMANDE	Commandes variées adaptables selon l'handicap, dont levier omni-directionnel, "push-button", "touch button"...
MODE DE FONCTIONNEMENT	Sélection Directe:
	Balayage: x
	Encolage:
"OUTPUT"	Tableau Dynamique Alpha-numérique:
	Dactylo:
	Télé-dactylo:
	Bande imprimée:
	Télévision:
	Autre: Mémoire
FEEDBACK	Visuel - chaque position est illuminée lors du balayage
AUTO-CORRECTION	Non applicable
MANIABILITE	Portatif
DIMENSIONS	"31" x 13" x 2" maximum
POIDS	11 livres ½
ACCESSIBILITE	oui
COUT	$ 1,100.00 approximativement, avec un seul système de commande
PARTICULARITES	- vitesse de balayage réglable - signal auditif - surfaces interchangeables disponibles ce qui permet un vocabulaire individualisé - mémoire allant jusqu'à 8 positions - positions de location ($ 50.00 par mois par $ 1,000.00)

Tiré-à-part: 3

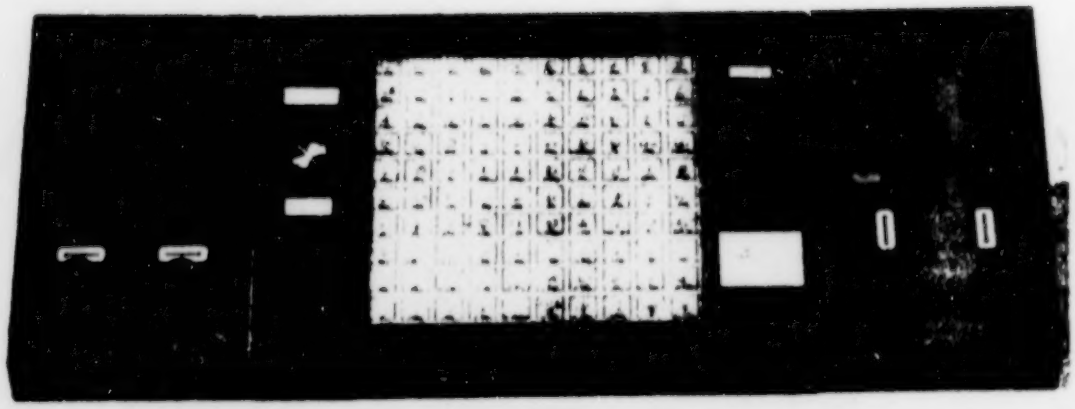
"Dufco Matrix Communicator - MC-3M"



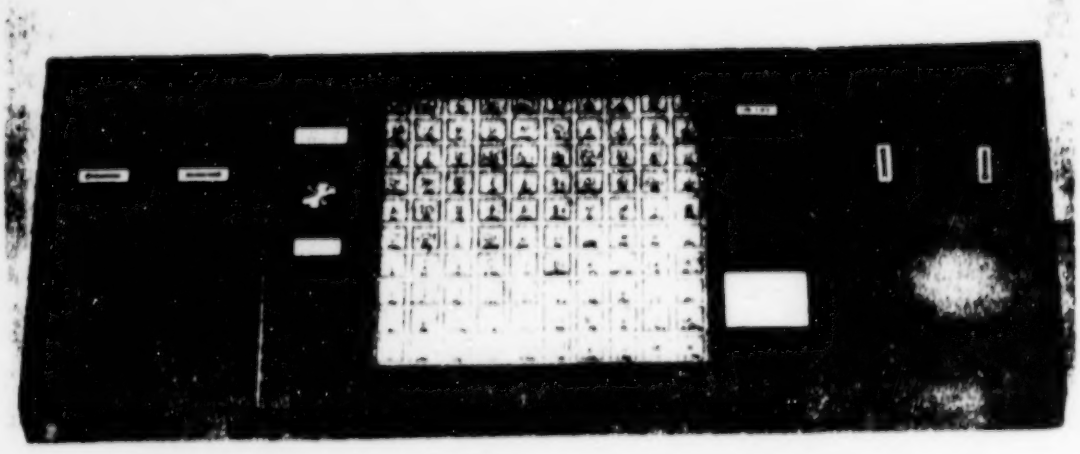
Model MC 2 Matrix Communicator
mounted on No. 1215 Tilt Stand
with No. 1157 Four Touchbutton Actuator



Model MC 2 Matrix Communicator
with No. 1158 Four Pushbutton Actuator Right Hand
and No. 1160 Audible Alarm
mounted on No. 1216 Wheelchair Tray Mount Right Hand



Model M-2 Matrix Commander
with Nos. 1150 & 1250 Actuator Assemblies



Model MC-2 Matrix Commander
with Nos. 1150 & 1250 Actuator Assemblies

Appareils distribués par:

M.E.D. québec
8620 Jean-Brillant, suite 105,
Lasalle, Québec.

- "P.M.V. Minimum"
- "P.M.V. Medium"
- "P.M.V. Maximum"
- "P.M.V. C.P. Printer"

NOM DE L'APPAREIL	"Systeme P.M.V."	
DISTRIBUTEUR	M.E.D. Quebec, 8620, Jean-Brillant, suite 105, Lasalle, P.Q.	
DESCRIPTION GENERALE	Système de claviers agrandis ou réduits, électroniques, qui fonctionnent par sélection directe et qui sont reliés à un dactylo I.B.M. 82-C par une unité solénoïde. Le P.M.V. offre un système "minimum" "médium" et "maximum", ainsi que le "C.P. Printer". Ce dernier, fonctionne par balayage. cf. page suivante	
SYSTEME DE COMMANDE		
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK		
AUTO-CORRECTION		
VARIABILITE		
DIMENSIONS		
POIDS		
ACCESSIBILITE		
COUT		
PARTICULARITES		

L'APPAREIL	"P.M.V. minimum"	
DISTRIBUTEUR	M.E.D. Québec, 8620, Jean-Brillant, suite 105, Lasalle, P.Q.	
DESCRIPTION GENERALE	S'adresse surtout aux sujets qui présentent des faiblesses musculaires. Ce système permet de dactylographier à l'aide d'un stylo et d'un clavier réduit.	
SYSTEME DE COMMANDE		
MODE DE FONCTIONNEMENT	Sélection Directe	x
	Balayage	
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	x
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	non	
AUTO-CORRECTION	oui	
MANIABILITE	semi-portatif	
DIMENSIONS	120 - par 95m.m.	
POIDS	.7kg - clavier 6.2kg - I.B.M. + solénoïde	
ACCESSIBILITE	oui	
COUT	$ 1,198.00 - $ 1,888.00 pour dactylo I.B.M. et unité solénoïde	
PARTICULARITES		

NOM DE L'APPAREIL	"P.M.V. Medium"	
DISTRIBUTEUR	M.E.D. Québec, 8620, Jean-Brillant, suite 105, Lasalle, P.Q.	
DESCRIPTION GENERALE	S'adresse surtout aux sujets ayant une incoordination modérée des mouvements. Ce système permet de dactylographier à l'aide d'un clavier agrandi.	
SYSTEME DE COMMANDE	le sujet pousse sur chaque touche	
MODE DE FONCTIONNEMENT	Sélection Directe	x
	Balayage	
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	x
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	non	
AUTO-CORRECTION	oui	
MANIABILITE	semi-portatif	
DIMENSIONS	6.20m.m. x 250 mm	
POIDS	6.4kg - clavier + 6.2kg = I.B.M. et solénoïde	
ACCESSIBILITE	oui	
COUT	$ 1,775.00 - clavier + $ 1,888.00 - Dactylo et unité solénoïde	
PARTICULARITES		

NOM DE L'APPAREIL	"P.M.V. Maximum"	
DISTRIBUTEUR	M.E.D. Québec 8620, Jean-Brillant, suite 105 Lasalle, Québec.	
DESCRIPTION GENERALE	S'adresse aux sujets présentant une incoordination assez importante. Ce système permet de dactylographier à l'aide d'un clavier encore plus agrandi que le médium qui peut même être actionné par le pied.	
SYSTEME DE COMMANDE	Le sujet pousse sur chaque touche.	
MODE DE FONCTIONNEMENT	Sélection Directe	x
	Balayage	
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	x
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	non	
AUTO-CORRECTION	oui	
MANIABILITE	semi-portatif	
DIMENSIONS	770mm x 495 mm.	
POIDS	12.6kg - clavier + I.B.M. et solénoïde 6.2kg	
ACCESSIBILITE	oui	
COUT	$ 1,865.00 + I.B.M. et solénoïde $ 1,888.00	
PARTICULARITES		

NOM DE L'APPAREIL	"P.M.V. C.P. Printer"	
DISTRIBUTEUR	M.E.D. Québec 8620, Jean-Brillant, suite 105, Lasalle, Québec.	
DESCRIPTION GENERALE	S'adresse aux plus handicapés qui ne peuvent faire usage d'un système par sélection directe. Le système permet de dactylographier en se servant d'un seul mouvement pour contrôler le balayage d'un tableau alpha-numérique qui est relié à la dactylo.	
SYSTEME DE COMMANDE	Les précisions sur le système de commande ne sont pas disponibles actuellement. Probablement levier basculant.	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	x
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque caractère est illuminé lors du balayage	
AUTO-CORRECTION	oui	
MANIABILITE	semi-portatif	
DIMENSIONS	tableau 660 mm x 120 mm + unité de contrôle 345 m.m. x 260 m.m.	
POIDS	tableau 5.3 kg. unité de contrôle 9.1kg	
ACCESSIBILITE	oui	
COUT	$ 5,485.00 (coût de I.B.M. 82 C - $ 1,888.00)	
PARTICULARITES		

Tiré-à-part: IV

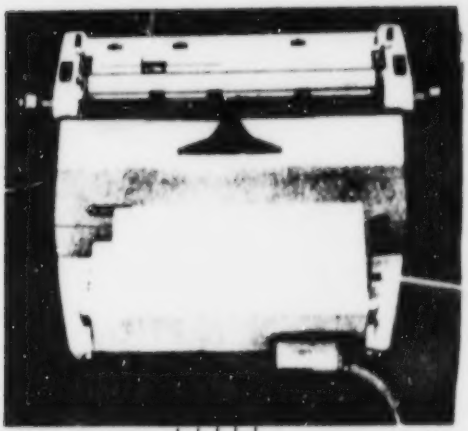
"P.M.V. Minimum"

"P.M.V. Medium"

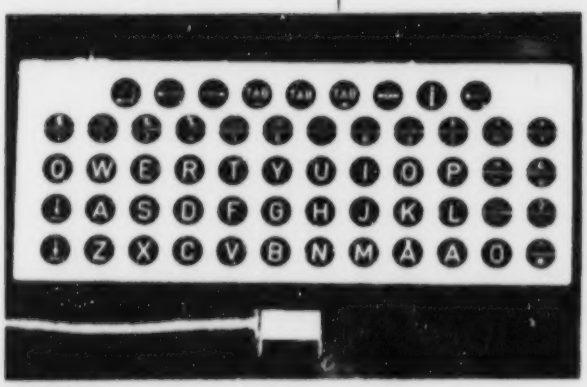
"P.M.V. Maximum"

"P.M.V. C.P. Printer"

The PMV

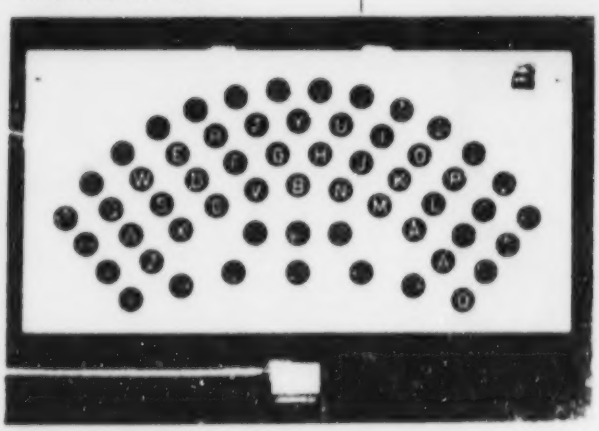


MINIMUM
Length 120 mm
Width 95 mm
Weight 0.7 kg
Order number 5500/*



MEDIUM
Length 620 mm
Width 250 mm
Weight 6.4 kg
Order number 5800/*

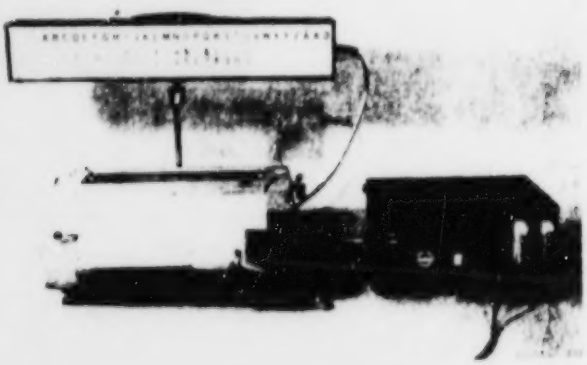
MAXIMUM
Length 770 mm
Width 495 mm
Weight 12.6 kg
Order number 6000/*



SYSTEM

SOLENOID UNIT
Weight 6,2 kg
Order number: 6500/*
for
6000/*, 5800/*, 5600/*
and 5500/*
6510/I-82C
for
5000/I-82C. Only available
for IBM 82C (C = Correction)

ORDER NUMBER
* = F for Facit electrical typewriter 1820
* = I-72, I-82 and I-82C for IBM electrical typewriter type 72, 82 or 82C (C = Correction).
For IBM only: Please state the width of the typewriter roller (13 or 15 inches).
* = O for Olympia electrical typewriter SG 50.
Example: 1 PMV 6000/ /I-82C and 1 PMV 6500/I-82C, 15 inches, means
One PMV MAXIMUM and one PMV SOLENOID UNIT
for IBM 82C (C = Correction) with 15 inches roller width.

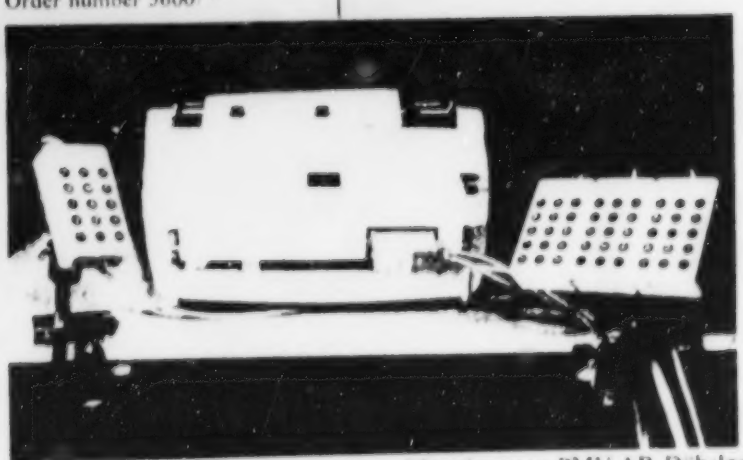


PRINTER

Display:	Length	660 mm
	Width	120 mm
	Height	120 mm
	Weight	5,3 kg
Control unit:	Lenght	345 mm
	Width	260 mm
	Height	160 mm
	Weight	9,1 kg

Order number: 5000/I-82C. Only available for IBM 82C (C = Correction)

COMBINATION
Length 112 mm (each)
Width 60 mm (-"-)
Weight 0.5 kg (-"-)
Order number 5600/*



Manufacturer: PMV AB Döbelnsgatan 34 C, S-113 52 Stockholm, **Sweden**.
Tel.: 08/15.14.84 Telex: 117 62 pmv s.

Appareils distribués par:

Prosthetic Services,
Sunnybrook Medical Centre
2075 Bayview,
Toronto, Ontario.

- "Remote Electronic Typing Aid" (RETA)

APPAREIL	"Remote Electronic Typing Aid" (RETA)	
DISTRIBUTEUR	Prosthetic Services Sunnybrook Medical Centre 2075 Bayview, Toronto, Ontario	
DESCRIPTION GENERALE	Clavier agrandi relié à un dactylo I.B.M. selectric 751 par une unité solénoïde et qui fonctionne par sélection directe. Ce système permet aussi un mode de balayage à l'aide d'un interrupteur et d'un tableau alpha-numérique de 58 positions. L'unité de contrôle se situe sous le le dactylo.	
SYSTEME DE COMMANDE	- levier omnidirectionnel; simple interrupteur mécanique - interrupteur photo-électrique - interrupteur opéré par la pression de la bouche ou de la langue	
MODE DE FONCTIONNEMENT	Sélection Directe	x
	Balayage	x - 4étapes nécessaires avant l'impression
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	x
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque caractère est illuminé lors du balayage; auditif - un signal sonore accompagne chaque illumination	
AUTO-CORRECTION	oui	
MANIABILITE	amovible au besoin	
DIMENSIONS	?	
POIDS	?	
ACCESSIBILITE	oui	
COUT	clavier agrandi - $ 1,200.00 (approximatif avec unité solénoïde) + coût du dactylo système de balayage - $ 1,500.00 avec unité solénoïde + coût du dactylo et système de commande.	
PARTICULARITES	- un signal sonore accompagne chaque étape du balayage et différencie l'horizontal du vertical. - il y a 2 types de balayage: le balayage à séquence régulière, et le balayage dirigé par le levier omnidirectionnel, dans les directions nord-sud-est-ouest et diagonal - le balayage est réglable de 1/8 sec. à 2 sec. par position, il peut être contrôlé soit par l'ouverture et la fermeture de l'interrupteur (exige une meilleure coordination) soit uniquement par la fermeture de l'interrupteur - possibilité d'emprunter ce dispositif pour un mois en septembre 1976.	

Appareils distribués par:

Physico-medical systems Corporation
5000, Buchan, suite 505,
Montréal, québec.

- Tableau de symboles Bliss "512"

- "Comhandi"

NOM DE L'APPAREIL	Tableau de symboles Bliss "512"	
DISTRIBUTEUR	Conseil national de Recherche du Canada, par contrat avec Physico-medical System, 5000 Buchan, suite 505, Montréal (ou autre compagnie de votre choix)	
DESCRIPTION GENERALE	Tableau de symboles Bliss comprenant 512 positions contenues à l'intérieur d'une malette, ce tableau dispose de plusieurs systèmes de commande et qui fonctionnent par balayage.	
SYSTEME DE COMMANDE	- levier omnidirectionnel, "optical joystick"; - "paddle", "photo diodes".	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	
	Bande imprimée	
	Télévision	
	Autre	Peut être adapté pour utilisation avec le VOTRAX, mémoire
FEEDBACK	auditif (votrax): visuel - chaque position est illuminée lors du balayage	
AUTO-CORRECTION	oui	
MANIABILITE	portatif	
DIMENSIONS	?	
POIDS	?	
ACCESSIBILITE	oui	
COUT	$ 1,000.00 approx. + coût pour chaque système de commande ($110.00)	
PARTICULARITES	- on peut varier le tableau et le balayage pour permettre de 32 à 512 positions. - il y a deux types de balayage; le balayage à séquence régulière, et le balayage dirigé par le levier omnidirectionnel dans les directions nord-sud-est-ouest - contient une mémoire de 16 positions - peut être utilisé avec le VOTRAX par l'intermédiaire d'un ordinateur	

NOM DE L'APPAREIL	"COMHANDI"	
DISTRIBUTEUR	Physico-Medical Systems Corporation 5000 Buchan, suite 505, Montréal, Québec.	
DESCRIPTION GENERALE	Appareil électronique stationnaire composé d'un tableau amovible de 64 carrés à surfaces interchangeables (images, symboles, lettres), d'un télédactylo, ainsi que d'une variété de systèmes de commande adapté au handicap de l'enfant.	
SYSTEME DE COMMANDE	Levier omnidirectionnel, "optical joystick", "paddle", "photo-diodes"	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	
	Dactylo	
	Télé-dactylo	x
	Bande imprimée	
	Télévision	
	Autre	VOTRAX [1], ordinateur
FEEDBACK	Auditif: VOTRAX; Visuel: chaque position est illuminée lors du balayage. un signal sonore accompagne chaque illum.	
AUTO-CORRECTION	Oui, au stade de balayage	
MANIABILITE	Stationnaire	
DIMENSIONS	télédactylo: 22" x 20" x 44"	
POIDS	100 livres	
ACCESSIBILITE	oui	
COUT	$1,500 sans télédactylo, avec 1 système de commande. Télédactylo: $800 approx. Chaque système de commande: $110.00	
PARTICULARITES	- Le mode de balayage est réglable, variant d'un balayage avec une séquence régulière à une sélection plus directe ou le sujet contrôle la direction du balayage - Pendant le balayage, chaque carré est illuminé et offre un signal sonore à deux tons: un pour la rangée et l'autre pour la colonne. - L'enfant peut contrôler différents appareils de l'environnement tels radio, lampe, etc. - [1] peut être utilisé avec le VOTRAX (synthétiseur de voix) par l'intermédiaire d'un ordinateur.	

Tiré-à-part: V

"Comhand1"

11 A COMMUNICATIONS SYSTEM FOR THE HANDICAPPED (COMHANDI)

OREST Z. ROY and JEAN R. CHARBONNEAU
National Research Council of Canada, Ottawa, Canada

Speechless children

The ability to communicate is one of man's most fundamental needs. The loss of this ability either through a congenital defect or through disease is perhaps the most infuriating and disturbing problem faced by anyone. Our involvement with communication aids for the severely disabled goes back 10 years when we first described a system[1] which was used by a speechless tetraplegic adult. Since then, we have modified the techniques to suit severely handicapped and speechless children.

The children for whom we designed COMHANDI are average or above average in intelligence, and range from six to nine years of age. Most are cerebral palsied children with varying degrees of spasticity, little or no fine motor control, poor head control, and extremely jerky and unrefined gross movements. Their age and the fact that they are taught the regular school curriculum require that the communications aid is as simple as possible to operate and comprehend, and that it uses standard letters and symbols. Thus, the child operates the input to COMHANDI directly with letters of the alphabet or numbers through a non-coded means of address selection. Most of the children expressed a distaste for any transducer attached to their heads and all required their mouths to be clear. With these considerations in mind we designed the following system.

Components

The components of COMHANDI are shown in Figs. 11.1 and 11.2. It consists of input transducers, a mode selector, a visual

Fig. 11.1 Block diagram of the COMHANDI Communications system

display and a teletypewriter. Basically the system uses a serial scan technique to arrive at any one of 64 addresses. The child controls the scanning direction by means of a transducer, which in its simplest form is a single on-off switch.

Output

The output of the device is in the form of printed letters or numbers and these are produced by a standard teletypewriter. The teletypewriter was chosen as the output device because it is inexpensive ($650) and because it could be used directly as an interface with a computer. These typewriters are designed for continuous and unattended use, they have a large and continuous paper supply, and are relatively free from trouble.

Display

The display board shown in Fig. 11.3 is essentially a reproduction of the teletypewriter keyboard. Since this display is portable and detachable, it can be placed next to the child for easy viewing. A total of 64 addresses are shown arranged in an eight-by-eight matrix; each address contains either a letter or symbol. All the addresses can be made available to the child or the number can be divided in two so that the child has access to only the first 32 (eight-by-four matrix) containing the alphabet or the next 32 containing the symbols. For the sake of clarity, we use a colour distinction between the alphabet and the symbols. The alphabet is shown on a yellow background while the symbols have a red background. The letters are arranged in alphabetical order, although any column or row can be transposed. We find the alphabetical order to be quite useful and simple to implement. In addition to the alphabet the first 32 addresses contain four triac controlled power outlets. Each is rated as 110V at 6 amp. These are used to activate the typewriter itself, radios, lights, and other appliances.

Audio and visual feedback is provided to the child by illuminating each address as it is turned on and simultaneously generating an audio tone. In effect two separate tones are provided; one denotes column scan and the other the row scan.

Mode selector

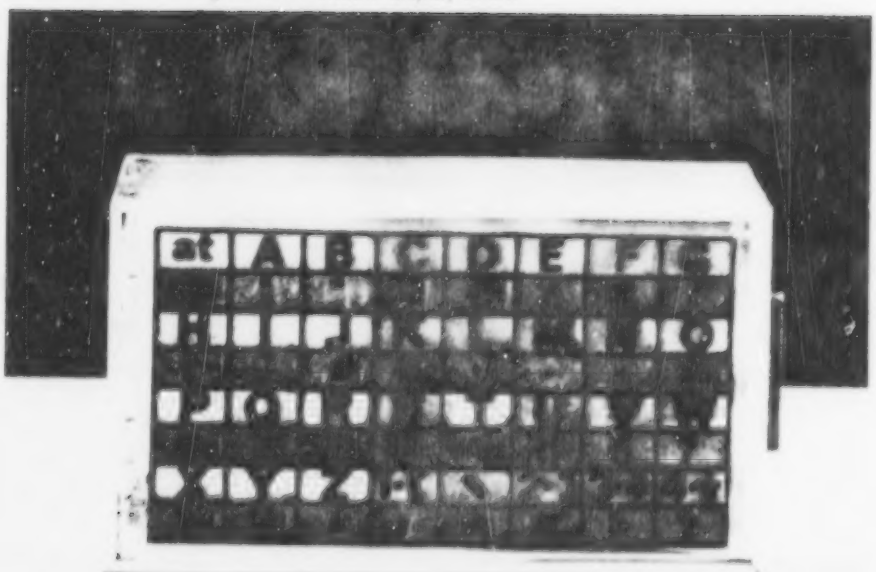
In any aid, the object is to produce a useful device at a minimum cost without sacrificing versatility and flexibility. We have attempted, in the design of COMHANDI, to allow for this by giving the user a choice of transducers and modes of operation. The mode selector (see Fig. 11.1) enables the child to use his or her abilities fully in the interaction with the machine. In effect, it enables the "teacher" to alter the degrees of automation and thus to control the extent to which the child is involved.

Automatic mode

In the most automatic mode, a single on-off switch is used as the transducer. In this mode the child is locked into a fixed scanning pattern and a home address. The home address is the upper left address on the display board containing the symbol "at". When the switch is first activated the column scan begins along the first row. Thus the letters A, B, C etc. are illuminated serially at a rate determined by the child's reaction time. The stepping rate can be varied from one second per step to a quarter second per step. When the switch is released the scan

Fig. 11.2 The COMHANDI function diagram

Fig. 11.3 Portable display board



terminates. The second transducer activation produces a row scan and the letters in any one row are illuminated serially, for example F, N, V etc. in row seven. Release of the switch automatically types the letter at the illuminated address or, with a controlled power outlet address, turns the power on. The next activation of the transducer resets the COMHANDI to the home address. In order to turn a controlled power outlet off, the address of the outlet must be revisited and the type command given.

Manual control

As the child's muscular control and dexterity increase more manually controlled functions are added and less of the set scanning mode used. For example, a manual-type switch enables any address to be activated without the necessary sequencing described previously. A multispace switch, carriage return and a space up feature enables the child to centre a composition and produce columns, tables etc.

The least automatic mode available with this system is a joystick transducer arrangement. This transducer allows the user to take the shortest path to any given address, ie up-down, right-left, or diagonally. Thus if the joystick transducer is activated to the right, the scanning will go right, and keep stepping in this direction until the transducer is released. A similar sequence occurs to the left as well as in the up-down direction.

Transducers

The transducer is the interface between the child and the machine and as such is the most important component in the system. The transducers that we have found most useful are shown in Figs. 11.4–11.7. Fig. 11.4 shows a set of mechanical paddle transducers. These consist of a mechanical single pole switch located at the base of a coloured wooden paddle. Each paddle is pivoted over a switch and each has a spring return to the off position. The tension on the spring can be adjusted to suit the child's needs. These transducers are suitable for use by most children in a hit and hold mode.

–Mechanical paddle

–Photo diode

Fig. 11.5 shows a set of transducers in which a light source and photo diode replaces the mechanical switch. These transducers are activated when the light beam from the light source to the

Fig. 11.4 A set of paddle transducers

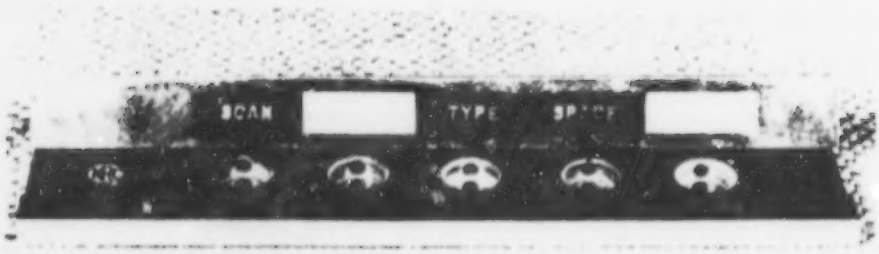


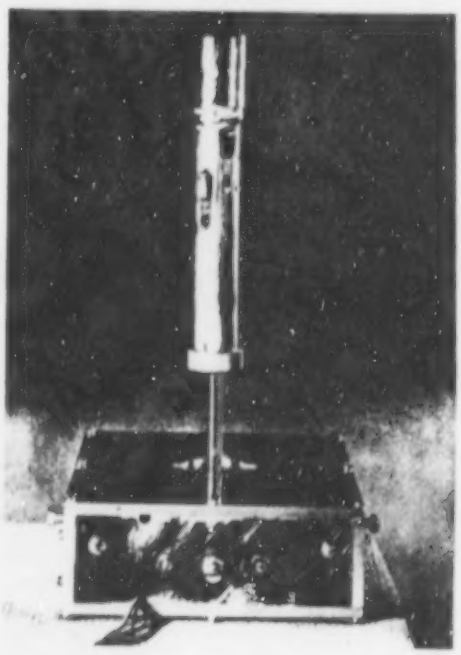
Fig. 11.5 A set of optical transducers

photo diode is interrupted, such as when a finger is placed in the large holes shown. Because these transducers require zero force they are used by children with little or no holding strength.

Mechanical joystick

Fig. 11.6 shows the mechanical joystick transducer. This transducer enables the child to reach any address by the shortest possible path. A total of four mechanical single pole switches are used. These switches are mounted at right angles to each other, ie at the NSEW division points of a compass. As the child pushes the joystick away the scan goes up; if the stick is pushed

Fig. 11.6 Mechanical joystick



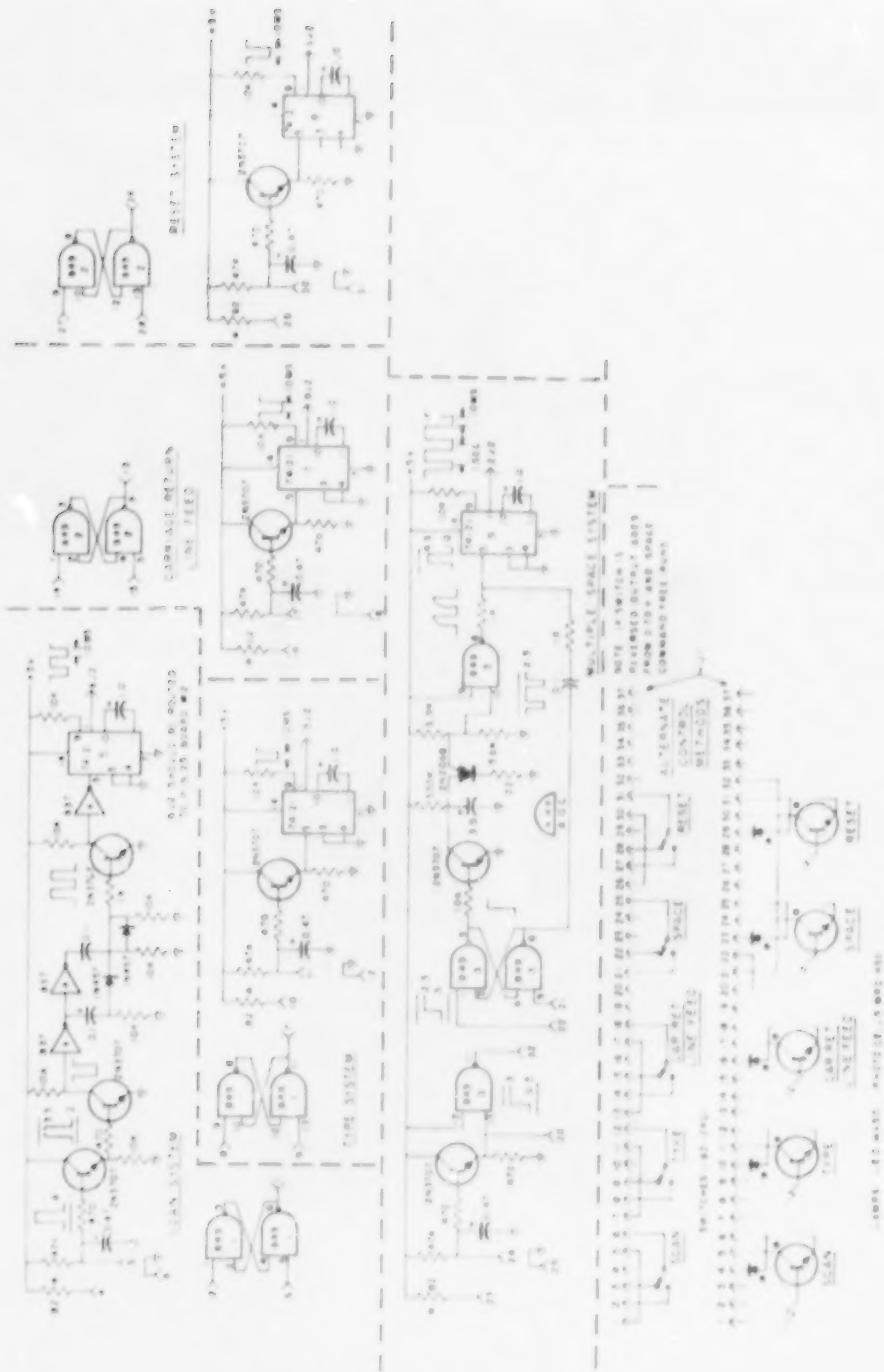


Fig 11.7A COMHANDI circuitry

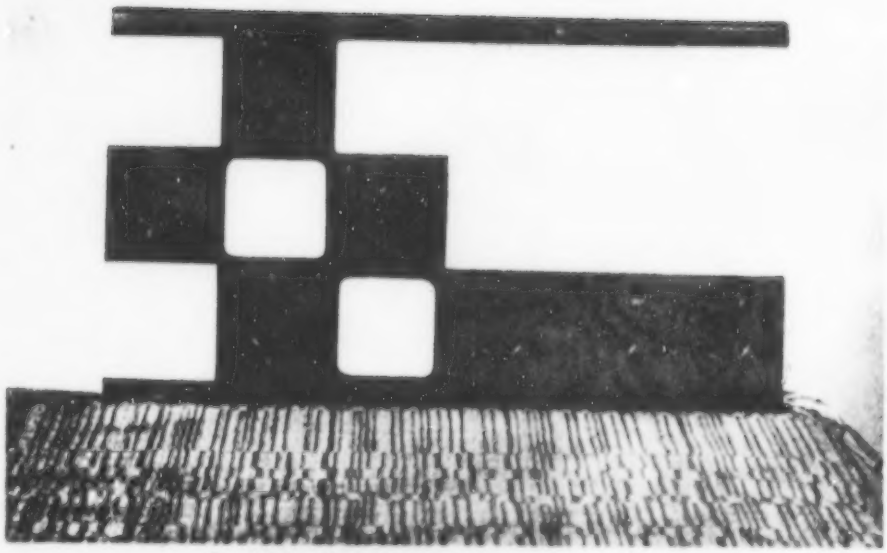


Fig. 11.7 Optical joystick

to the left the scan goes left and if the joystick is pushed in between the scan goes diagonally. The transducer is such that precise position control is unnecessary — so long as the stick is pushed to within $\pm 22.5^{\circ}$ of centre any one of the switches will be activated. The manual type switch is located on top of the joystick and the multispace and carriage return-space up switches are set on the shaft.

Optical joystick

Fig. 11.7 shows the optical joystick. The operation of this transducer is equivalent to the mechanical joystick except that a light beam must be interrupted as previously described. The three holes along the bottom of the joystick are for manual type, multispace, and carriage return-space up.

The optical joystick uses a single light source and four photodiodes. The light source is located at the centre of the joystick and the photo diodes at the compass points. The light from the source is coupled to the photodiodes through four shafts or holes which run in the NSEW direction from the centre of the joystick. The joystick is activated when a finger is placed in one of the large holes and thus interrupts the light beam. Up-down, left-right activation is obtained by placing a finger in the north, south, east, west hole respectively. Diagonal scanning results when two holes are simultaneously obstructed.

The circuitry for all these transducers is shown in Fig. 11.7A. As

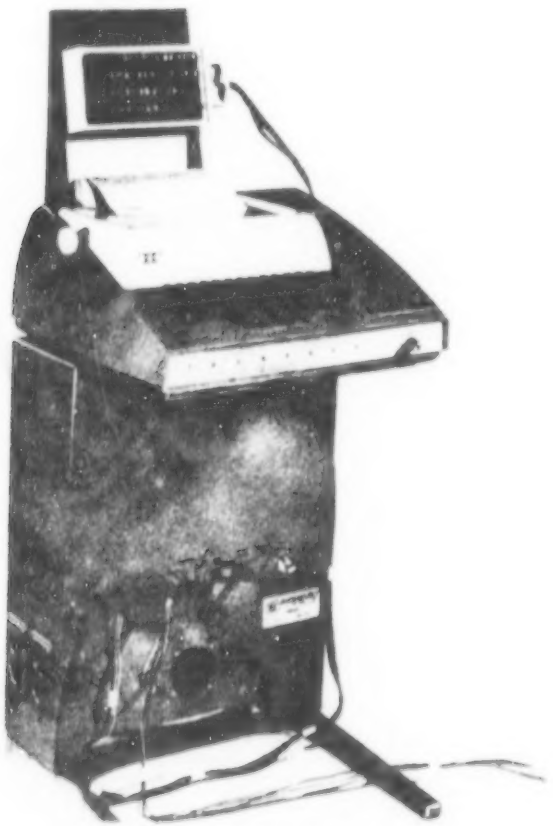


Fig. 11.8 The completed COMHANDI system

shown, any of the transducers described can be coupled to the COMHANDI through a 37 pin input connector.

In general the optical systems can be coupled directly to the clocks and other activating circuitry, while the mechanical systems must be coupled through antibounce circuitry. We have not been able to find a dry mechanical switch which can be used directly. These switches tend to bounce when turned on or off and in so doing produce misfiring and unreliable operation. The antibounce circuit consists of two cross coupled nand circuits (DTL 849s) and each mechanical switch has one. The remaining circuitry consists of monostable multivibrators (1/3 74121) and clocks (2N2068).

The complete system is shown in Fig. 11.8. The four controlled outlets are mounted on the side of the teletypewriter base and all the necessary electronics are mounted inside the base.

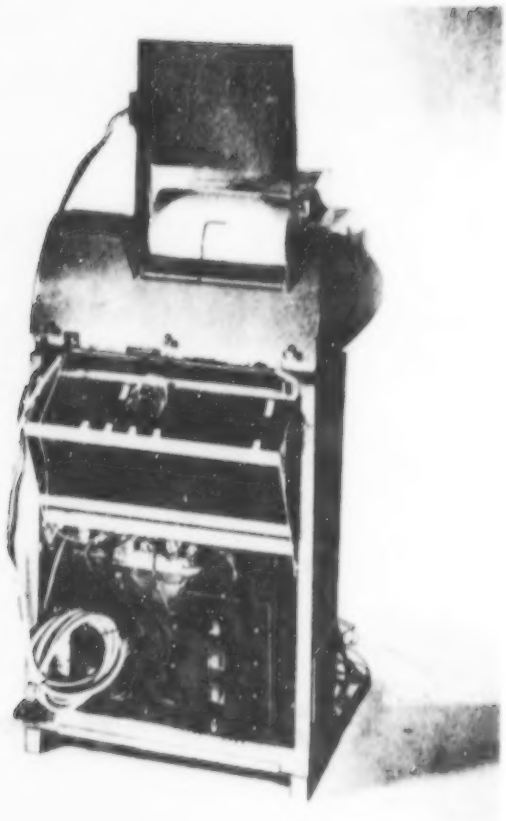


Fig. 11.9 Constructional details of COMHANDI

Fig. 11.9 details the construction of the system. The triac switches which control the power outlets are mounted on heat sinks as shown, while the COMHANDI logic is mounted on boards within a swing-out chassis. The system uses TTL logic and is entirely solid state except for some of the mechanical transducers already described.

Cost

The component cost of the whole system including the typewriter is $950. The cost of electronic components in this total is $135, while the switches, mounting hardware, chassis etc. is $150. The next version of COMHANDI will have three printed circuit boards to replace all those shown in Fig. 11.9, thus reducing the cost of mounting hardware, connectors etc.

Summary

COMHANDI is being used by young disabled children as an instrument of communication. It is used in the regular school curriculum for letter and number identification as well as for

spelling, arithmetic, and general composition. Teachers who have used the system find it a dependable means of assessing the child's comprehension and assimilation.

COMHANDI has enabled some severely disabled children to produce legible print for the first time, and those who have other means of communication open to them—such as an electric typewriter—prefer COMHANDI because they find it is less fatiguing, more accurate and, in most cases, faster.

---

[1] Roy, O. Z., (1965), "A communication system for the handicapped" *Med. Electron. Biol. Engng.*, **3**, 427.

Appareils distribués par:

The Biomedical Engineering Centre
Tufts New England Medical Centre
Boston, Mass., U.S.A.

- "Tufts Interactive Communicator" (TIC)
- "ANTIC"
- "SYNTIC"
- "CRYPTIC"

NOM DE L'APPAREIL	"Tufts Interactive Communicator" (TIC) et dispositifs associés	
DISTRIBUTEUR	The Biomedical Engineering Centre - Tufts - New England Medical Centre Boston, Massachusetts, U.S.A.	
DESCRIPTION GENERALE	Dispositif à interrupteur unique qui ne demande qu'un seul mouvement de coordination grossière pour contrôler le balayage d'un tableau alpha-numérique de 56 positions. Deux étapes sont nécessaires (balayage de la rangée et de la colonne) avant l'impression de la lettre ou du chiffre sur une bande de papier. Le caractère choisi apparait simultanément sur un écran électronique acceptant jusqu'à 32 "lettres", chiffres ou autres symboles.	
SYSTEME DE COMMANDE	levier basculant (information incomplète actuellement)	
MODE DE FONCTIONNEMENT	Sélection Directe	
	Balayage	x
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	x
	Dactylo	
	Télé-dactylo	
	Bande imprimée	x
	Télévision	
	Autre	
FEEDBACK	Visuel - chaque position est illuminée lors du balayage - le caractère apparaît sur le tableau dynamique alpha-numérique	
AUTO-CORRECTION	oui	
MANIABILITE	semi-portatif (doit être branché)	
DIMENSIONS	17" x 8" x 12" (approximatif)	
POIDS	20 livres (approximatif)	
ACCESSIBILITE	?	
COUT	$ 2,500.00 (approximatif)	
PARTICULARITES	Lettres disposées de manière à suivre l'ordre de fréquence dans la langue anglaise (vitesse en anglais amélioré de 30%) Subit quelques modifications pour offrir les avantages suivants: * portatif (batterie rechargeable) * écran de télévision pour exposer le message avec possibilité de correction et d'impression directe par commande unique. * dictionnaire de 400 mots ou phrases (max. de 4000 caractères) afin d'augmenter le potentiel du dispositif au niveau du vocabulaire (mémoire). Le dictionnaire sera accessible par un système d'encodage. * balayage anticipatoire des lettres les plus susceptibles de suivre les 3 lettres imprimées précédemment.	

NOM DE L'APPAREIL	
PARTICULARITES (suite)	Ce mode de balayage pourrait augmenter la vitesse de communication de 50% tout en conservant le même système de commande. (ce dispositif est présentement en évaluation et s'appelle l'ANTIC). De plus, en voie de développement, il y a: -1 Un dispositif moins sophistiqué, sans possibilité d'imprimer le message, ayant 8 ou 48 espaces où on pourrait placer pour l'enfant au stade de pré-lecture des images, symboles, ou lettres, selon l'approche (SYNTIC) -2 Un dispositif qui permettra l'impression de symboles Bliss afin d'augmenter l'autonomie de l'enfant au stade de pré-lecture (CRYPTIC) -3 Le TIC, ANTIC, SYNTIC et CRYPTIC fonctionnent tous par balayage avec un seul interrupteur. Le centre développe présentement un système qui fonctionnera par sélection directe où la disposition d'images symboles, lettres ou mots pourrait se faire de façon individuelle, selon la coordination de chaque sujet. Cet appareil le "Tactile Communicator" pourrait contrôler les mêmes dispositifs d'output que le TIC.

Tiré-à-part: VI

"TIC"

A Communicative Assist for the
Non-Verbal Severely Handicapped

TIC

The Tufts Interactive Communicator (T.I.C.) is an electronic device which allows a severely disabled, non-verbal person to communicate his thoughts through the medium of spelled words. The T.I.C. is designed to be operated by a person who is too disabled to successfully control an electric typewriter or any communication device requiring considerable motor coordination.

Prerequisites for patient use of the T.I.C. are:

1. Unimpaired eyesight
2. One residual controllable muscular movement
3. The mental ability to express thoughts in spelled words

Given that the user possesses all of these, the T.I.C. will transform his muscular movements into printed letters which can be organized into words.

PHYSICAL DESCRIPTION

Figure 1 indicates the important components of the T.I.C. The entire unit is self contained. The only necessary interconnections are the patient input (made through a phono-plug in the rear) and the power cord. The system controls; ON-OFF, and Rate control, are mounted on the rear to avoid unnecessary visual clutter on the front panel.

On the front panel are the visual keyboard, and the two output devices. These, along with his input switch, are all the patient needs to spell. Characters are presented by an interactive sequencing arrangement (to be more fully explained later) on the visual keyboard. The user directs the sequencing and makes his selections using his one muscular movement to depress a switch. The chosen characters are printed on the paper tape, which moves to the left after each new character. Each character is visable immediately after it is printed.

The frequency of repair of the T.I.C. is expected to be low due to the use of digital integrated circuits throughout. These require little maintenance, and have an extremely long life expectancy. Minor details such as replacement of paper tape and fuses can be handled easily since the paper tray and fuse holders are conveniently located on the outside of the T.I.C.

PATIENT INPUT

The man-machine interface is perhaps the most crucial detail concerning the T.I.C. As was stated earlier, the patient need only have control of one muscular movement. The restrictions on the word "controllable" are that the user be able to make that motion in order to depress a switch, and not make that movement when no input is desired. The patient's response time can be in the range of one

to ten seconds per input. This variation is accounted for by an appropriate change in the T.I.C.'s sequencing rate.

The location of the input switch is entirely dependent upon the patient. Various switches have been devised to allow maximum control by the patient. These utilize certain body motions, such as head-turn, knee-jerk, kick, and finger motion. Regardless of the means of making an input, the operation of the T.I.C. remains the same.

OPERATION OF THE T.I.C.

The T.I.C. features an interactive visual keyboard which contains 56 squares in which are printed alpha-numeric characters and short words. (The words may be of up to 4 characters and in the bottom row only.) When the T.I.C. is in the idle state, each row of squares is sequentially illuminated. The user must make a switch input to choose the row in which his desired character resides. The T.I.C. will then scan the individual squares in that row. When the desired character is illuminated, the user makes a second input on his switch. Upon receiving the choice signal, the T.I.C. will flash the chosen square to indicate the choice. On the sixth flash the character is printed, and the sequencing immediately returns to the idle mode, beginning at the top row again.

ERROR DETECTION

The user may experience a common difficulty in making an input. The input may occur early or late, thus choosing the wrong row or character. A high frequency of such errors indicates an improper sequencing rate, or an incorrectly placed switch. However if this type of error occurs infrequently, it can be at-

tributed to a temporary lack of control that may be caused by spasms, distractions, or some other spurious disturbance.

The T.I.C. accounts for these random errors by allowing the user to negate his choice. Once a character is chosen, it flashes for a period of time. In order to confirm that character, the operator simply waits until the letter is printed. If he recognizes the flashing letter to be incorrect, he can make a third input on the switch. The T.I.C. will not print the character, but will return to the beginning of the row and resequence it.

THE VISUAL KEYBOARD

Since the patient must interact with the visual keyboard, it is essential that the keyboard contain information that best suits his needs. The keyboard may have any combination of letters, numbers and symbols displayed in the 48 squares of the first 6 rows. In the 7th row, short words of up to 4 characters may be offered.,

The keyboard for children is arranged in alphabetical order. This is for the reason that their educational world is structured alphabetically. For an educated patient, the keyboard is arranged in order of frequency of use of the individual characters.

The arrangement according to frequency yields approximately a 1/3 reduction in spelling time.

The words [illegible] used fall into a number of categories:

Short words: [illegible]

Responses: YES, NO

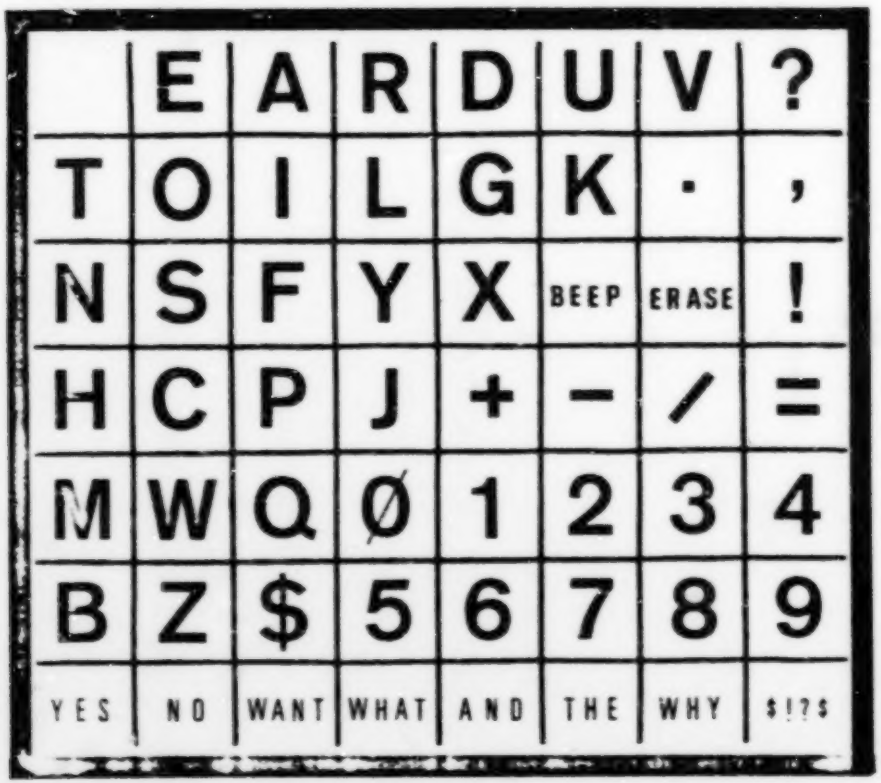
Names: RICK, JANE

Emotion: [illegible]

OUTPUT MEDIUM STORAGE

The principal medium of output is 1/2 inch wide paper tape. The tape printer was chosen as an economical trade-off. The T.I.C. has need of output that is both visable and hard copy. Electronic displays offer excellent visability, but no hard copy. Electronic typewriters, or teletypes offer nicely paged printout, but their size and construction prohibit the user from conveniently viewing the output.

While many adults could use the paper strip printer as the sole output medium, many children have experienced difficulty in reading the small type. Because of this, the electronic display has been incorporated into the design. The display prints 1/4 inch high orange letters on black background. This is extremely visable output. A chosen character is printed simultaneously on both the printer and the display.



VISUAL KEYBOARD

Engineer Who Cares

Breaking the Silence Barrier

Engineer develops devices that give nonverbal cerebral palsy victims the power of communication

Bill Lauffer, Assistant Editor

Cerebral palsy is a disease that sometimes takes away the power of speech, and Rick Foulds is an engineer who is trying to give it back again. A CP patient may have good control of only one muscle in his entire body, but Foulds has developed a communication device that can operate with that one muscle.

Before Foulds' communicator was developed, ten-year old Ricky Hoyt's only method of communication was smiles and nods in response to "twenty questions". Cerebral palsy had arrested his physical coordination at the 6-month level, but he had all the intelligence of other children his age.

Still, Ricky's parents and teachers practically had to be able to guess what he was trying to say. Ricky's therapist felt that a better means of communication would "unlock" his intelligence and make him more independent, so she asked a biomedical engineer for help. That engineer was Dr. William Crochetiere of Tufts University's Department of Engineering Design, and he asked his design class to take on the project.

The class had five students one of them Foulds. They all went to work on the "Tufts Interactive Communicator", putting in well over 1000 man-hours of time during a six-week period (in addition to their regular course loads). Their efforts resulted in a portable unit that sequences slowly-flashing lights along an alphanumeric panel.

As the lights sequence, Ricky picks out first the row of letters, and then the actual letter, that he wants. Originally he did this with a head-activated switch, but his knees proved to have better muscular control for hitting the switch. The letter then lights up on the panel. Ricky can check for mistakes and correct them before the letters appear on the sixteen-character "moving sign" display.

The result: communication for a previously-trapped mind. But it might be important to consider where the money came from. To put it simply—it didn't. The labor was free, of course, but Foulds and his fellow students had to scrounge for all they were worth. Cannibalized surplus equipment provided some parts, and the Burroughs Corp. donated a display unit.

When the initial communicator was completed, Foulds decided to build a smaller, improved version. But this newer, more reliable version was going to take more time and money. Armed with their previous success, Crochetiere and Foulds had Ricky demonstrate the communicator before a number of church and civic groups. The sight was impressive, and donations followed. With Mrs. Hoyt running bake sales and organizing a dinner dance, the total contributions amounted to $3,000 and Foulds began work again.

Team of students designed the original Tufts Interactive Communicator.

PHYSICAL DATA

Dimensions	17 inches wide x 8 inches high x 12 inches deep
Weight	Approximately 20 pounds
Power	120VAC 60HZ Approximately 50 watts
Printing Medium (1)	Pressure sensitive paper tape - 1/2" wide
Character Size	1/8" high x 1/10" wide Black on White
Characters Per Roll of Paper Tape	Approximately 20,000
Printing Medium (2)	Electonic Display
Character Size	1/4" high x 3/16" wide Orange on Black
Characters Visable at Any One Time	32

Engineer Who Cares

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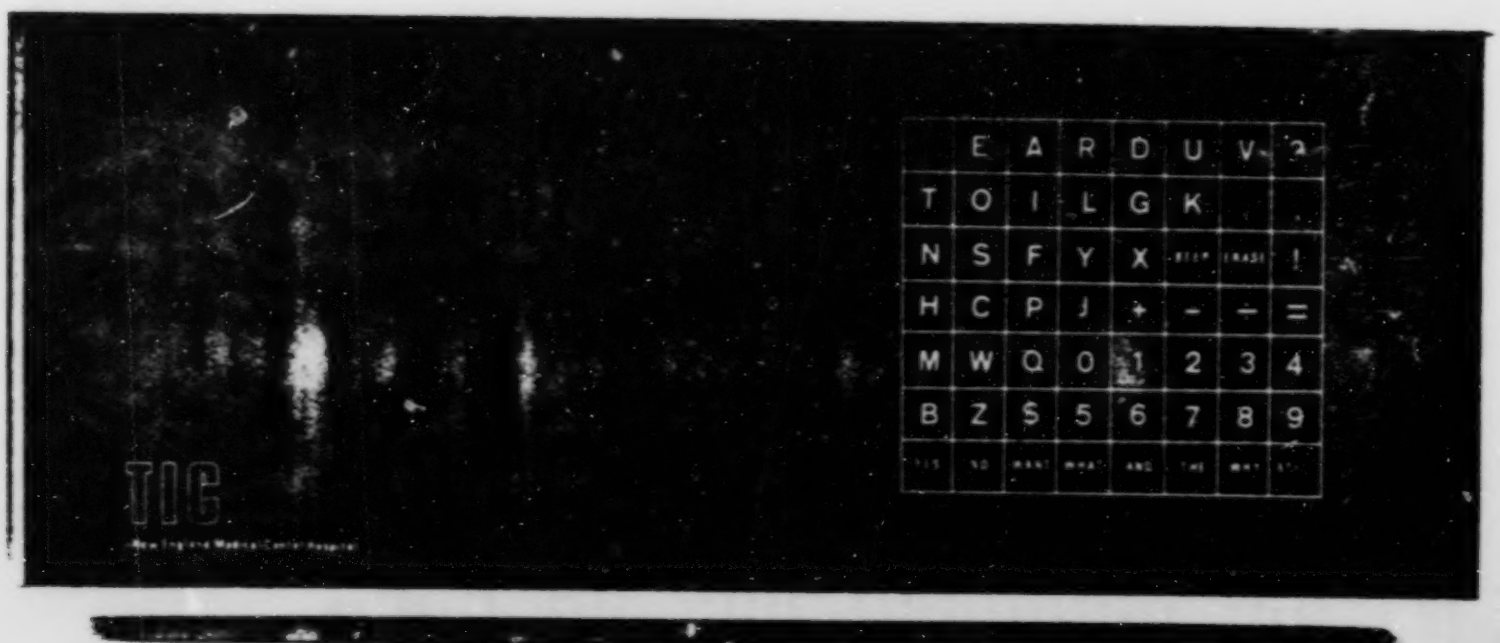
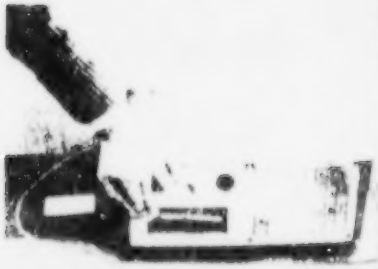

E A R D U V
T O I L G K
N S F Y X
H C P J + - = =
M W Q 0 1 2 3 4
B Z $ 5 6 7 8 9
TIC

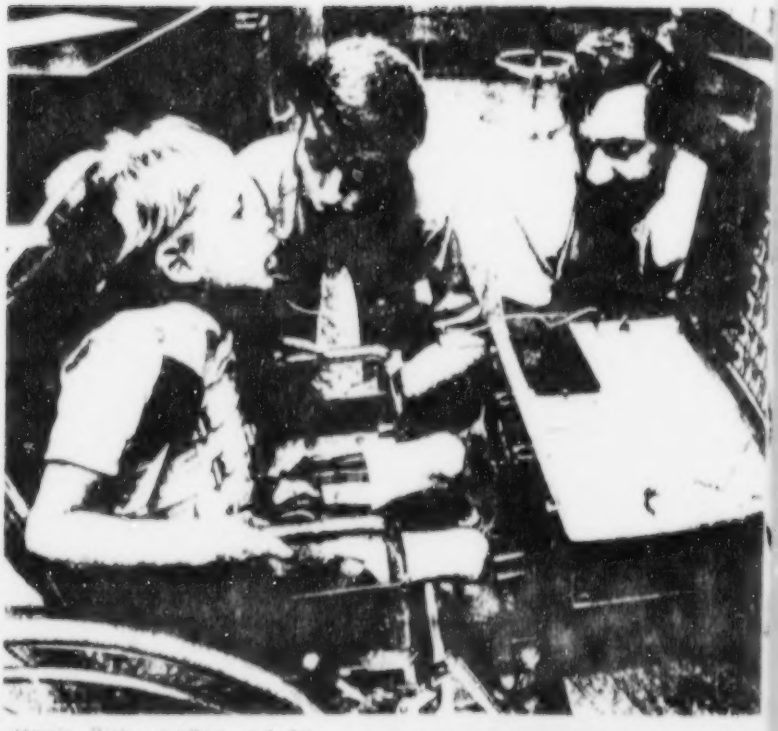


As you can see, the third-generation communicator is even smaller and produces hard-copy output. We'd like to build more communicators for other handicapped people, but we'd have to make them manufacture self-supporting. —R.F.

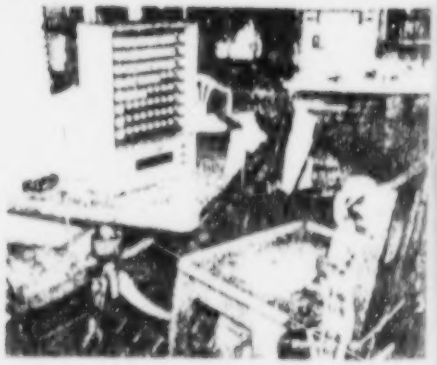
The second version was wire wrapped, had better PC boards, and weighed far less than its predecessor. The new knee-activated switch helped reduce Ricky's response time per character from roughly 3 to 4 seconds down to 1 to 2 seconds.

Ricky has worked with the new device on a daily basis for over a year now, and his ability to communicate has improved measurably. A third version of the communicator allows him to produce hard-copy output; with it and more training he should be able to someday "converse" at newspaper levels of vocabulary.

And not all the success is Ricky Hoyt's. In part, the work that Foulds and Crochetiere did led to the establishment of a Biomedical Engineering Center at the Tufts-New England Medical Center in Boston. With funding provided by the Research and Training Division of HEW's Social and Rehabilitation Services, new projects in assisting the handicapped are underway. These include a command unit enabling paraplegics to control appliances remotely and a video-display newspaper reader run by the paper tape that normally controls linotype machines.



Here's Ricky spelling out his name on the original communicator, while Bill Crochetiere (right) and I look on. With this model, Ricky chose letters and activated the display with a head switch. —Rick Foulds, biomedical engineer



The communicator isn't just a theoretical device. Ricky works with it every day. This photograph was taken in his home where he has used the communicator for over a year. —R.F.

The second version (shown) is more reliable and compact than the first, which fit into two briefcases. The switch Ricky is demonstrating it with is similar to the new knee switch that increased Ricky's response time noticeably. —R.F.

TOS
E A R D U V 2
T O I L G K
N S F Y X
H C P J + - = 1
B Z S 5 6 7 8 9
M W Q 0 1 2 3 4

THE TUFTS NON-VOCAL COMMUNICATION PROGRAM

by

Richard A. Foulds Gregory Baletsa
William J. Crochetiere* Chester Meyer
Biomedical Engineering Center
Tufts-New England Medical Center
Boston, Massachusetts

Summary: This paper describes the efforts of the Biomedical Engineering Center in conducting both research and applied studies in the area of non-vocal communication for the severely physically disabled.

Introduction

The application of technology to the field of Rehabilitation Medicine has offerred the promise of restoring or assisting physical functioning of a severely physically disabled person. A major area of concentration of the Biomedical Engineering Center has been that population which is prevented from normal communication because of a profound motor dysfunction. The lack of speech and writing skills due to muscle incoordination, weakness, or paralysis is evident in disorders such as cerebral palsy, ALS, traumatic head injury, and stroke. While each of these is medically different, the resultant absence of communication is commonly devastating in terms of the person's social, educational, and vocational life.

The Biomedical Engineering Center (BMEC) has staffed its non-vocal communication project with three engineers, an occupational therapist, and a special educator. The goals of the project are to identify technological means of assisting a person to better communicate, and work within the community in the application of assistive devices.

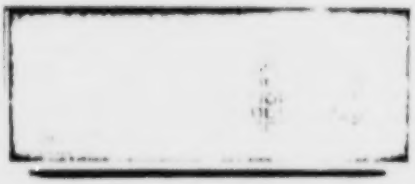
At the present time, the BMEC is under contract to the Massachusetts Bureau of Special Education to work with special needs programs throughout the state providing this type of technical support. As of this writing, twenty-two special education classrooms have been equipped with electronic devices developed by the BMEC. At the same time, the BMEC is working with other agencies and institutions in examining the communication needs of other disabled individuals. Older people who may have been educated before an accident or the onset of a disease do not require educational support, but may require a faster, more powerful device than would a child who is disabled from birth and is learning language in spite of his disability.

A very difficult situation is the older cerebral palsied person who may have been entirely missed by the educational system. He may be extremely intelligent while lacking the formal language skills necessary for effective use of an assistive device.

In order to meet the needs of a varied population, the BMEC has begun to develop a series of communication devices that span the entire range of communication possibilities. This effort will hopefully give the individual a choice of which machine (if any) he wishes to use. The remainder of this paper describes the developments of this program.

The TIC and Related Devices

The Tufts Interactive Communicator[1] (TIC) has been designed as a single switch input typing device that can be operated by a single grossly controllable muscular movement. The need for such an easily operable unit was identified early in the project. While many non-vocal individuals can operate more complex interfaces, the single switch feature finds extensive use with the most severely disabled. The user selects the characters from a visual keyboard that offers rows of characters by successive illumination. A single switch closure chooses the illuminated row, and commands the TIC to scan the characters in that row. A second switch closure chooses a single illuminated character. Once selected, the letter or number is printed on a hardcopy medium, and is displayed electronically. In this way messages are constructed on a letter-by-letter basis.



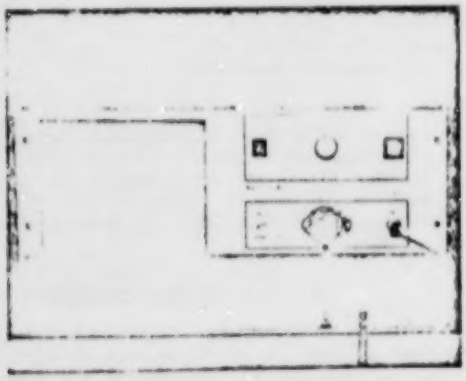
Front Panel of the TIC
Fig. 1

The TIC that is now in use differs only slightly from that which was developed over 5 years ago. The method of letter selection has proven to be effective and hence is unaltered. The visual keyboard has been rearranged to take advantage of

*Associate Professor of Engineering Design
Tufts University Medford, Massachusetts

the rank order of characters in the English language. This represents an approximate 30% speed improvement over an alphabetically-ordered visual keyboard.

Recent developments in low power electronics have offerred the potential for battery operation of the TIC. Since funding for redesign of this device was not readily available, the program staff proceeded cautiously, looking for an appropriate time for a design change.



Rear Panel of the TIC
Fig. 2

The current equipment modifications are actually taking place in two directions. The present TIC offers a 32-character electronic display, and a paper strip printer. These functions are being transferred into a smaller, portable unit with an operating life of eight hours before recharging is necessary. The existing TIC, for which a large price has been payed for tooling development, will simultaneously be upgraded into a more powerful communication tool. This device will offer a complete video display that can be edited and modified by the user. The corrected text can then be "dumped" onto a typed page. This will hopefully provide the flexibility required for academic and vocational activities.

The Dictionary

Each person who communicates either through written or spoken language tends to use a vocabulary that is smaller than that actually at his disposal[2]. This may be evident in conversational idioms, or in key words or phrases (i.e. jargon) of a geographical location, or business environment. Part of the Non-Vocal Communication Program's activities has been to identify ways of shortening the user's time involved in transmitting a message. The method chosen has been to incorporate a dictionary of 400 words or phrases that can be custom programmed into a personalized TIC. The new circuit card can accommodate 4 increments of 1000 letters. Therefore the complete dictionary will consist of no more than 400 entries whose total length is no longer than 4000 letters. While this provides an average of 10 characters per entry, the actual word or phrase lengths will be independently set.

The selection of such a large number of entries offerred a challenge in the design of a visual keyboard. The magnitude of a 400 entry keyboard (400 words + the standard TIC keyboard) would prevent efficient use due to long scanning times. An encoded method was determined to be the desirable approach. The bottom row of the TIC keyboard is designated with the numbers one through eight, indicating dictionary page numbers. Each character of the existing keyboard will represent a different word on each page. Selection of a word is accomplished by first choosing a page number, and then the appropriate keyboard character. The desired word will be taken from the dictionary memory and displayed on the output device.

Anticipatory Communication[3]

An important consideration in the application of a communication device is the speed with which its operator can make an output. The rate of output is limited by both the user's input time response, and the size of the scanned visual keyboard. Although the vocabulary and verbal skills of the user are expected to improve with training, the physical input cannot be expected to do the same. Disabilities such as cerebral palsy do not generally change dramatically and will most likely require the user to use the same grossly controlled input motion for his lifetime. ALS is a progressive disease and will result in a loss of motor control over time.

As can be understood from above, the easy solution of "speeding up" the scan rate is impractical. Improvement cannot be found in reducing the keyboard size since the TIC keyboard contains essential entries for alphabetic and numeric output as well as punctuation and arithmetic symbols.

A major effort of the BMEC has been to study the application of language redundancy to this rate problem. Results of the project have shown a theoretical improvement of approximately 50% over the standard TIC. Present studies are focusing on the display techniques that will maintain this level of improvement when the device is used by a human operator.

Based upon knowing no prior characters p=.19
Based upon knowing 1 prior character p=.28
Based upon knowing 2 prior characters p=.40
Based upon knowing 3 prior characters p=.51

Probability of Correctly Predicting
the next Character to be Typed
Fig. 3

The current state of the research has yielded a prototype device appropriately named the ANTIC (Anticipatory TIC) which predicts the six most likely letters to follow the letter most recently chosen. This prototype is being studied with the assistance of a high-level spinal cord injured client who is providing valuable information on its acceptability as a working design. In order to reach the 50% improvement, the statistics on letter frequency will be based not upon the single prior choice, but upon the three previous selectio

Symbol Communication

All of the above devices require that the user have the ability to spell, or at least

recognize words from the dictionary. Within the Non-Vocal Communication Project there has been identified the need for a less sophisticated device that will identify locations rather than character symbols. The solution to this need has been a small relatively inexpensive device that offers the user the choice of eight or 48 squares. Filling these squares will be symbols, letters, or pictures attached to small plastic clips. The same type of switch as is used in the TIC or ANTIC can stop the scanning at a particular symbol and cause the light to flash as an indication of choice. The Symbol TIC or SYMTIC scans the eight squares in a linear fashion, or scans the 48 in a row-column manner. There is no printout provided in the unit. The SYMTIC is envisioned as a teaching tool for early intervention with non-readers and can be used with various teaching systems such as the Peabody Rebus Reading Program[4], or the alternative language programs like the Bliss Symbolics.[5]

Symbol Printing

The principal difficulty encountered with the SYMTIC is its lack of a printed output. This prevents the user from communicating independently since his listener must remain within viewing distance.

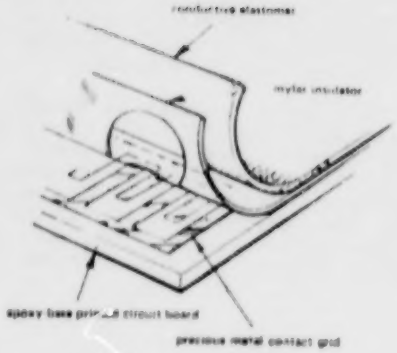
The BMEC is trying to rectify this situation by developing a printing unit that will reproduce graphic symbols. The Cryptographic TIC or CRYPTIC will initially be programmed for use with the Bliss Symbols and will be assigned to the Vermont Achievement Center in Rutland, Vermont.

Electronic Letterboard

The devices described throughout this paper have been operated by a single input switch. Many non-vocal individuals are capable of greater interaction with a machine. Letterboards have been commonly used by those clients who have some residual pointing ability or the use of a head-pointer. Letterboards[6] have the advantage of being inexpensive and entirely flexible since they are only paper on which a teacher or clinician writes words and letters, or draws pictures. The locations of these objects can be determined according to the physical abilities of the user. Midline crossing problems, hand preference, or varying dexterity can be minimized by the proper placement of the symbols.

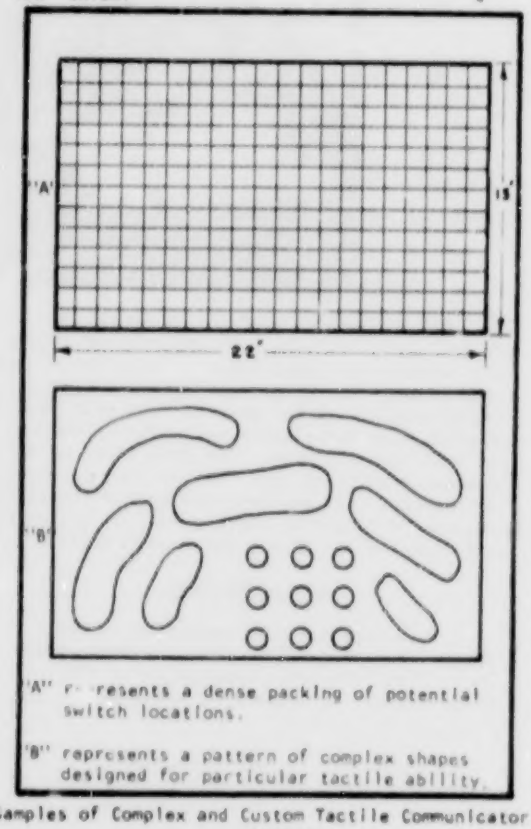
Electronic conversion of these letterboards has not been able to offer the same flexibility. The use of mechanical switches and sensors presents physical limitations that prohibit total flexibility. Expanded typewriter keyboards offer a fixed arrangement that may often be unsatisfactory to a user. Varying the size of that keyboard or even changing the size of the switches requires a major mechanical task. The Autocom[7] of the University of Wisconsin offers an attempt at flexibility with several optional arrangements of the magnetic proximity switches.

The BMEC has contracted with the Flex Key Corporation of Gloucester, Massachusetts for the fabrication of a flat switch panel that measures 11" x 15" and contains 4000 switch contacts arranged in a honeycombed grid. The Flex Key Corp. graciously donated the engineering time required in the design of the switch panel.



Elastomeric Switch Structure
Fig. 4

The switching mechanism is a proprietary process owned by Flex Key[8] and utilizes the properties of a conductive elastomer. The entire panel consists of a large printed circuit card and a layer of elastomer separated by a mylar insulator. The entire panel is approximately 1/8" thick.



"A" represents a dense packing of potential switch locations.

"B" represents a pattern of complex shapes designed for particular tactile ability.

Samples of Complex and Custom Tactile Communicator Layout
Fig. 5

The switch contacts are .25" in diameter on [illegible] centers. Assuming that the smallest object to touch the panel will be a human finger, at least one of the switches will be closed when the panel is touched. Once the switch closure is made, the X and Y coordinates of the contact will be detected by external circuitry. The force required to register an input is less than 10 ounces. The switch movement is .005 inches.

That external circuitry is now being developed and will allow the teacher or clinician to define clusters of switches as words or letters. In this way a totally flexible letterboard surface may be custom designed to meet the user's needs. The logic circuitry will identify the appropriate input and operate the same type of printing devices as are already in use in the TIC.

Tufts Interactive Communicator in Clinical Setting
Fig. 6

Technology Utilization Project

The Biomedical Engineering Center has felt an obligation to make available the results of its research and development. This has already been evident in the project within the State of Massachusetts. Other devices have also been made available to individuals and institutions for use in their own programs. The BMEC tries to maintain contact with these sites and provide any possible assistance. All devices have been offerred as a service of Tufts-New England Medical Center and are made available on a non-profit basis.

Acknowledgement

This work has been supported by HEW Rehabilitation Services Administration Grant 16-P-57856/1-01 and a Contract with the Massachusetts Department of Education.

References

1. Foulds, R.A., Gaddis, E.: "The Practical Application of an Electronic Communication Device in the Special Needs Classroom", Proceedings of the Conference on Devices and Systems for the Disabled. Krusen Center for Research and Engineering, Philadelphia, Pennsylvania. 1975, pp. 77-80.

2. Miller, G., Language and Communication, McGraw-Hill Co. c 1951, 63.

3. Foulds, R.A., Baletsa, G., Crochetiere, W.J. "The Effectiveness of Language Redundancy in Non-Verbal Communication", Proceedings of the Conference on Devices and Systems for the Disabled. Krusen Center for Research and Engineering, Philadelphia, Pennsylvania. 1975, pp. 82-86.

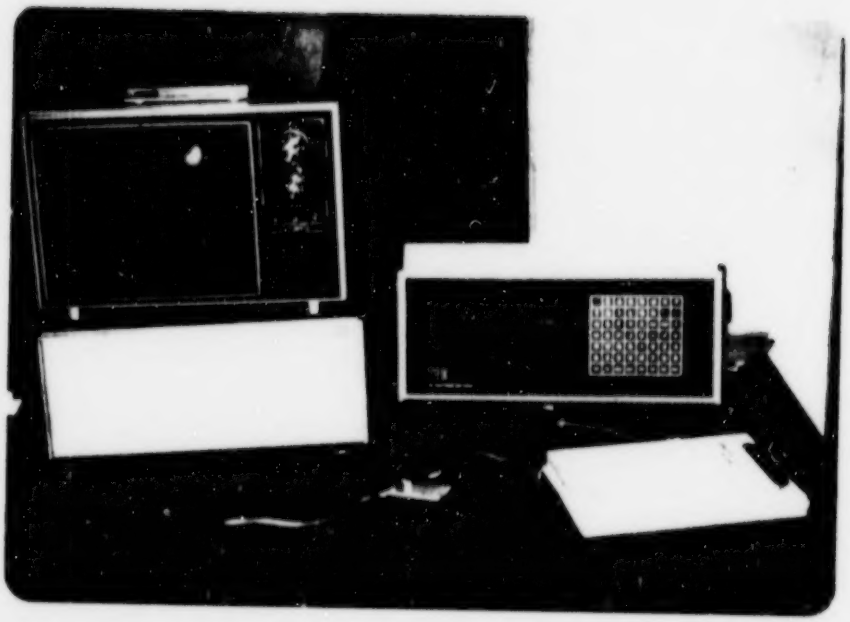
4. Woodcock, R., "The Learning Disabled and the Peabody Rebus Reading Program", A Paper presented at the Annual Convention for the Council for Exceptional Children, Chicago, Illinois. April 1970.

5. Teaching Guideline - Symbol Communication Research Project, Ontario Crippled Children's Centre. Toronto, Ontario. 1974.

6. Vicker, B., Nonoral Communication System Project, University Hospital School, The University of Iowa, Iowa City, Iowa. c 1974.

7. Participant Resource Book, 1975 National Workshops on Non-Vocal Communication Techniques and Aids, The University of Wisconsin, c 1975.

8. Flex Key Brochure 10-73-FK-5K
Flex Key Corporation, Gloucester, Massachusetts



Appareils distribués par:

Trace Research and Development Centre,
922, Erb,
1500 Johnson Drive,
Madison, U.S.A.

- "Auto-Com"

NOM DE L'APPAREIL	"Auto-Com"	
DISTRIBUTEUR	Trace Research and Development Center 922, E.R.B. 1500 Johnson Drive, Madison, U.S.A.	
DESCRIPTION GENERALE	Appareil électronique contenu dans une épaisse tablette qui peut être installée sur toute chaise roulante standard, et qui fonctionne avec une batterie rechargeable. Un mince rouleau est installé dans la tablette ce qui donne la possibilité d'impr[illegible] des mots entiers, des phrases, etc. Le sujet glisse un aimant sur la surface de la tablette. Il l'arrête pour un temps prédéterminé au-dessus de la lettre ou autre symbole choisi. Ceci permet la transmission du "message" à un des dispositifs de "output". Un contrôle moteur assez grossier est tout de même requis. Permet une autonomie totale une fois la tablette installée.	
SYSTEME DE COMMANDE	Interrupteur sensible au contact d'un aimant ("proximity switch") Champs d'activation (de chaque interrupteur) et vitesse réglable. Un seul mouvement est nécessaire.	
MODE DE FONCTIONNEMENT	Sélection Directe	x
	Balayage	
	Encolage	
"OUTPUT"	Tableau Dynamique Alpha-numérique	x (coût inconnu présentement)
	Dactylo	x (I.B.M. correcting selectric) $ 625.00 approximatif $1500.00 pour modif.
	Télé-dactylo	x $700.00 approx.
	Bande imprimée	x
	Télévision	x $800.00 approx.
	Autre	VOTRAX, TRANSFER Ordinateur, CRT Terminal, voir aussi l'item Particularités
FEEDBACK	Visuel et/ou auditif selon le dispositif d'output	
AUTO-CORRECTION	oui	
PORTABILITE	portatif	
DIMENSIONS	20" x 24" x 2¼"	
POIDS	13 livres	
ACCESSIBILITE	Production limitée	
COUT **	Voir aussi coût des différentes modalités de "output" Tablette avec bande imprimée - $2,000.00 approximatif	
PARTICULARITES	WORDMASTER: Permet un changement de vocabulaire selon le sujet (image symboles, lettres, mots,) à l'aide de cartouches de mémoire interchangeables. Permet une programmation de vocabulaire individuel pour différentes situations. L'adulte et même l'enfant peut changer ou ajouter des mots au Wordmaster sans un changement de cartouche (max. 32 mots). Permet de changer la dimension et l'emplacement des carrés sensibles contenant les lettres ou autres symboles selon la capacité physique de l'enfant	

NOM DE L'APPAREIL

PARTICULARITES (suite)

"VOTRAX": Permet un feedback auditif à l'aide d'une voix électronique qui répète le mot correspondant à l'image, symbole, ou carré choisi à l'aide d'un ordinateur. Coût $4,000.00 (approx.). Disponible au Federal Screw Works, Vocal Interface Division, 500 Stephenson Highway, Troy Michigan 48084, U.S.A.

"TRANSFER": Permet l'impression sur papier du message apparu sur l'écran de télévision en touchant simplement la position "copy" $200-300)

"RADIO EMETTEUR-RECEPTEUR": Permettra l'utilisation des différents dispositifs de "output" sans fil, dans un champ limité. (ex. à l'intérieur de la classe), ainsi que le contrôle de l'environnement.

"7- BIT BINARY CODE": Permet le contrôle d'une grande variété de dispositifs, tels machines à enseigner, LOGO. (voir annexe IV), etc, ainsi que le contrôle de l'environnement.

L'AUTO-COM peut être utilisé avec tout appareil de 110 BAUD, serial ASCII ou parallèle ASCII ou "7 bit binary input code", ainsi que des ordinateurs et CRT terminal.

* Plusieurs enfants équipés de l'unité centrale (la tablette portative) peuvent se servir des mêmes dispositifs de "output"

** Coût approximatif de l'Autocom avec divers dispositifs de "output" (l'idéal):

unité centrale	$2,000.00
I.B.M. Selectric modifié	2,125.00
télévision	800.00
Votrax	4,000.00
transfer	300.00
tableau Dynamique A-N	?
Radio émetteur récepteur	?
	$9,235.00

avec télédactylo au lieu de I.B.M. selectric modifié: $7,835.00
pour un enfant, chaque enfant additionnel: $2,000.00

Suite aux informations recueillies au Congrès de Boston, le 10-11-12 juin 1976:

L'autocom est encore en période d'évaluation, Il sera sur le marché dans à peu près 2 ans et offrira le grand avantage de pouvoir choisir le mode de fonctionnement (encodage ou sélection directe) selon l'handicap.

Un autre dispositif, le VERSICOM, offrira plus ou moins les mêmes avantages que l'AUTOCOM, mais permettra un choix entre balayage et encodage.

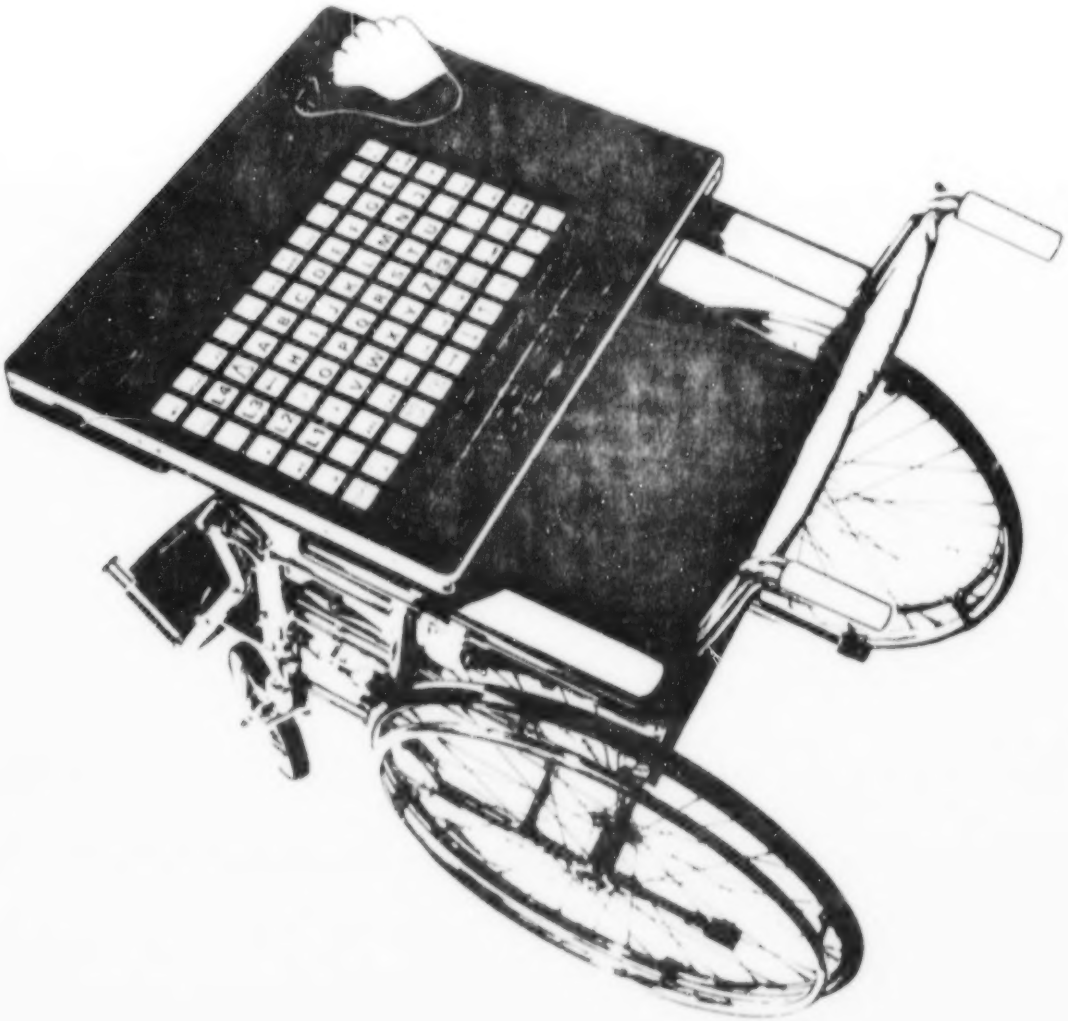
De plus un prototype est en voie de développement qui permettra l'utilisation de symboles Bliss avec l'Auto-Com et la possibilité d'impression de symboles.

Tiré-à-part: VII

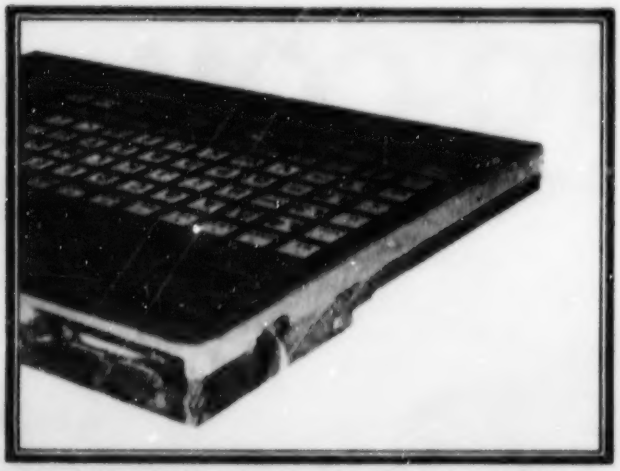
"l'Auto-Com"

The AUTO-COM™

An Auto-Monitoring Communication Board



The Auto-Com is a significant new communication aid designed for those physically handicapped persons who have had to rely on manual communication boards as their primary expressive mode of communication. Designed especially for use by cerebral palsied children, the Auto-Com requires only minimal pointing skills to operate. These pointing skills can be with the hand, head, wrist, foot or any other part of the body with which the child can point. Initial results of an evaluation program indicate that any person who is capable of using a communication board should be able to achieve independent communication through use of the Auto-Com. The Auto-Com is also suitable for use by other types of physically handicapped persons who possess rough pointing skills but lack fine motor control.



Completely portable operation is possible because of the Auto-Com's internal rechargeable battery pack and sub-miniature strip printer.

An overnight charge from the battery charger will last through the heaviest days use.

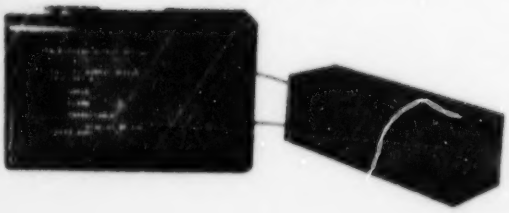
For education, recreation, and employment the Au
can be connected directly to a television display or
This provides the user with excellent visual feedbac
100% correctability.

The AU

Operation

The Auto-Monitoring Communication Board (Auto-Com) is a completely independent communication aid built into a special wheelchair laptray. It has a smooth, flat Formica-like surface on which letters, numbers and commonly used words have been printed. This Auto-Monitoring Communication Board (Auto-Com) is operated in the same manner as a traditional communication board except that a magnet is used in pointing to the various letters instead of a finger, knuckle, headstick, etc. A special magnetic sensing system inside the lapboard tracks the position and movement of the pointer-magnet and prints out the letters or words as the user points to them. This system has been designed to handle a wide range of pointing abilities, including the erratic pointing motions of cerebral palsied children.

The heart of the Auto-Com is the Auto-Monitoring technique. This technique combines a matrix of wide angle magnetic proximity switches with a delay activation mechanism to produce a sensing system which is sensitive to reduction of movement rather than to discreet movements as in traditional switching arrangements. This insensitivity to erratic movements causes the Auto-Com to ignore small tremors as well as momentary loss of control due to spasms or over-excitement. The delay activation mechanism also allows the user to slide his hand around over the surface of the board when moving between selected letters. Momentarily pointing to letters as he moves over them will not cause them to print out. The user is therefore able to use the smooth surface of the Auto-Com to increase his hand control or to support the weight of his hand if he is weak.



Mounted directly on the wheelchair, the Auto-Com can be used as a worktray when not being used to communicate. In this manner it is always in front of the user but never in the way.

The pointer-magnet used to operate the Auto-Com can be mounted in many different ways to take best advantage of a user's specific abilities. Shown: clenched fist handpiece, molded handpiece, wristband and headstick.

O-COM

Features

The Auto-Com is completely contained within a 18" x 24" x 1½" lapboard. It is wheelchair mountable, using standard Everest & Jennings wheelchair brackets. An internal, re-chargeable battery pack and built-in miniature strip printer make the unit completely self-contained and fully portable. The Auto-Com, which weighs only 13 lbs., also has a handle for ease in transportation.

The Auto-Com's hard, smooth surface allows it to be also used as an ordinary laptray. Thus, the board can be used for eating, playing or work, when not being used for communication, and is therefore always available in front of the child.

In addition to printing the letters of the alphabet, numbers, mathematical symbols and punctuation, the Auto-Com also has the ability to print out entire words, phrases and sentences with single pointing motions. The Auto-Com's memories may contain up to 192 eight-letter words, 128 of which may be selected by the user. The "Wordmaster" option not only increases the speed of communication for Auto-Com users, but also allows children who are not yet able to spell to communicate using the Auto-Com.

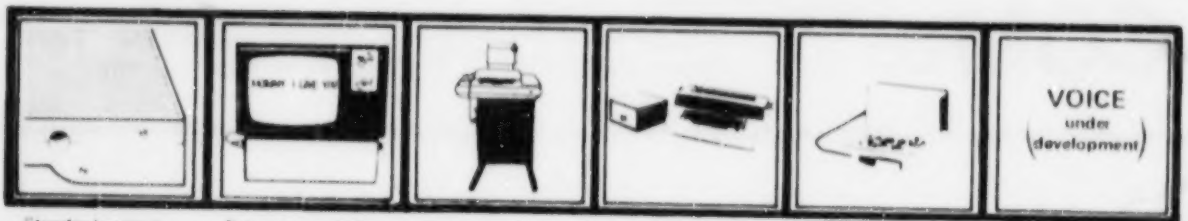
The Advantage of Auto-Monitoring ™

The Auto-Com is very similar, both in appearance and operation, to the ordinary communication board or language board. In both cases the child communicates by pointing to letters or words which are printed or painted on the hard, smooth surface, to indicate the message. With a traditional board, however, a second person is needed to monitor the child's erratic pointing,to memorize or record which letters or words he is trying to indicate,and to determine his message. This is time-consuming and demands the total attention of the second person.

The Auto-Com, however, monitors and determines the correct letter automatically, printing it out for the child. In this manner the child is able to communicate completely independently. The person he is talking to need only take a short time to read the message to find out what the child has said. This is of particular value in the classroom where the teacher has limited time to spend with each student. With an Auto-Com, the child is able to compose his message on his own, requiring no more time of the teacher than a normal question or comment. This allows the child to participate much more fully in class activities including lectures, discussions, and question and answer periods. In addition, the child has a means of doing independent work, homework and exams.

ALTERNATE OUTPUT FORMS

In addition to the subminiature strip printer, the Auto-Com™ can directly control a large variety of other output devices.



Standard output Form (ASCII) allows auto com to directly control computers etc.

Television or CRT Display for LARGE clear versatile and correctable display

Teletypwriter low cost form printed output non-correctable

Correctable IBM selectric modified a highly versatile form of printed output

Transmitter link allows Auto Com to control any output device by radio control

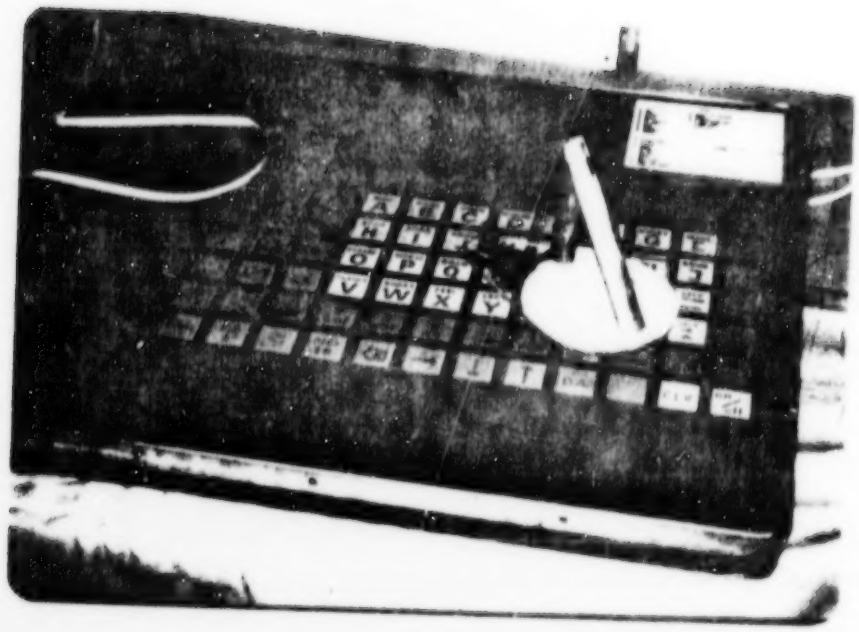
Vocal interface to facilitate conversational or group communication

The Cerebral Palsy Communication Group, an interdisciplinary student team at the University of Wisconsin, is working on the communication problems faced by non-vocal severely handicapped children. The group initially concentrated on the communication problems of the cerebral palsied, but has now expanded the scope of its efforts to cover all forms of handicapping conditions which leave an individual unable to communicate through speech or writing.

CPCG Cerebral Palsy Communication Group
University of Wisconsin-Madison

[illegible]

This work is supported by Grant EC-40316 of the National Science Foundation and Grant OEG-0-74-7461 of The Bureau for the Education of the Handicapped, Office of Education (HEW).



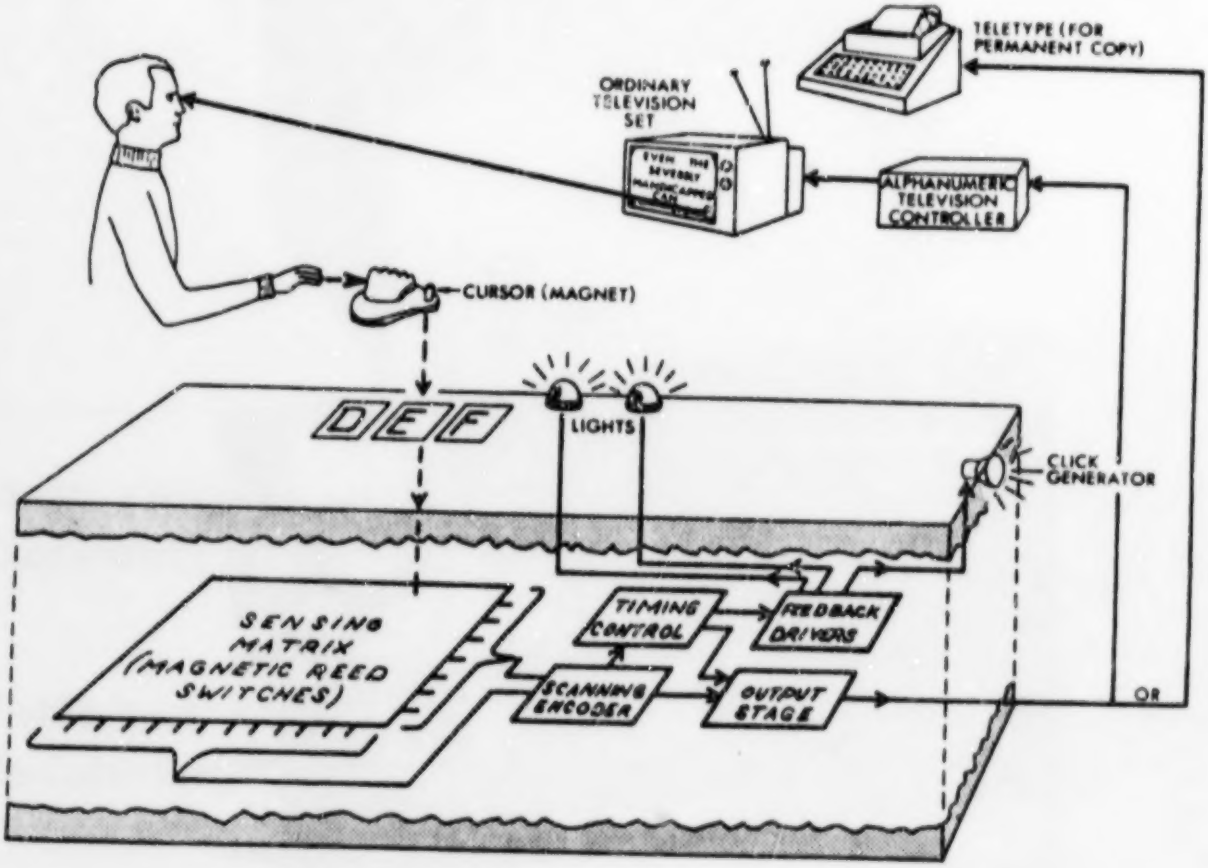


Figure 2—Exploded diagramatic view of the Auto-Com system showing major functional blocks

Votrax®

ML-I MULTI-LINGUAL VOICE SYSTEM

- **Multi-Lingual Capability**

The VOTRAX Model ML-I is a unique solid-state device which produces high-quality electronically synthesized speech. This unique system combines low unit cost, unlimited vocabulary, operational simplicity, low data requirements and multi-lingual capability to provide the ultimate in flexibility and cost effectiveness. In addition to excellent English, the ML-I can speak fluent German. Other languages, including Spanish, French, Japanese and Parsi (Persian), are presently under consideration for development as optional languages.

- **Unlimited Vocabulary**

The ML-I is programmed to speak based on phonetic coding principles. Each 12-bit command word selects one of 122 phonemes (sounds), one of eight levels of inflection (pitch) and one of four phoneme rates (duration). Optionally, the command word may be used to alter entire utterances with regard to amplitude (volume) and/or rate. When used in this latter fashion, the command word is referred to as a "Flag" command. Utterances are "spelled" phonetically to produce all combinations of words and phrases required by the application. Since words and phrases are stored in the form of digital information on some storage medium, such as magnetic disc or solid-state memory, there is virtually no limitation as to the amount of vocabulary the ML-I can produce. One well-known computer services company reports a vocabulary in excess of 300,000 words. The value of unlimited vocabulary is that the same VOTRAX unit can be used for any and all applications.

- **Low Data Requirements**

The unique VOTRAX technology permits the production of speech at uniquely low data rates. At twelve data bits per phoneme command, the ML-I can achieve continuous speech from input at less than 300 bps. The result is maximum utilization of communications channels.

- **Operational Simplicity**

The VOTRAX ML-I is designed to be as simple as possible to install and operate. All VOTRAX interfaces are compatible with most conventional computer and communications equipment (EIA Serial and TTL Parallel). In the case of the EIA unit, the interface controls are comparable to the Bell 103 and 202-type modems. Consequently, an asynchronous communications adapter that is compatible with the Bell 103 or 202 will attach to VOTRAX without modification. Since this system operates in the same way as an asynchronous data terminal, any standard ASCII terminal driver software will provide device support for VOTRAX. Data formats are either Serial ASCII or 12-bit Parallel. The user needs to do little more than prepare his application program to start effectively using the ML-I. Consequently, the VOTRAX system becomes productive quickly, easily and with a minimum of expense.

- **Flexibility**

The VOTRAX ML-I was developed to fit into a wide variety of applications and physical environments. A complete range of interface types and options makes VOTRAX compatible with virtually all computers, from the largest business mainframes to the smallest microprocessors. The small amount of data and limited controls required to drive VOTRAX permit installation at almost any point in a communications network: host computer, communications concentrator, communications multiplexor, or computer terminal. Data rates of 110 to 9600 bps also allow the ML-I to fit into existing systems with little or no change. Operating temperature and humidity specifications are such that specially conditioned environments are not required. Applications include: Computer Timesharing, Education, Handicapped Aids, Instrumentation, Manufacturing, Military and Training Simulators.

SPECIFICATIONS

Electrical
Input Power Requirements . . . . . 115 VAC ± 10%, 47-420 Hz, 0.38 Amps
Input Power Fuse . . . . . 3AG - 1/2 Amp, 125 Volts
Audio Output . . . . . 100-5000 Hz, 6 Volts Peak, Nominal
Audio Output Drive Capability . . . . . 0.5 Watts into an 8 Ohm load

Physical
Stand-Alone Cabinet . . . . . 11-7/8" W x 11-1/4" D x 6-1/4" H, 20 Lbs.
19" Horizontal Rack . . . . . 19" W x 10-1/4" D x 7" H, 20 Lbs.
Phonetic Keyboard . . . . . 16-3/16" W x 11-3/4" D x 4-3/8" H, 13 Lbs.
Speaker . . . . . 15-1/8" W x 6-3/4" D x 8-1/8" H, 10 Lbs.

Environmental
Operating Temperature . . . . . 0° C. to 50° C.
Storage Temperature . . . . . −20° C. to 70° C.
Operating Humidity . . . . . 0 to 95% with no condensation

Data Rates (bps)
110, 150, 300, 600, 1200, 2400, 4800, 9600

Interface Types
EIA Serial (RS232C) 403/407-Type Dataset Compatible
Dataswitch (Connects to Asynchronous ASCII Terminal)
FIFO Buffered Parallel (TTL)
FIFO Buffered Vocabulary ROM (TTL)
Keyboard (Connects to Phonetic Keyboard)

Command Word
7-bits: 128 selections available, includes phonemes, pauses and control functions
3-bits: 8 levels of inflection available
2-bits: 4 rate (duration) selections available

Options
Dataset, 403-Type
Touch Tone* Pad, Acoustically Coupled
Phonetic Keyboard
Vocabulary Development Service
External Amplifier with Tone Control
Customized Interfaces

* Registered Trade Mark of the Bell System

CONTACT:

EAST COAST
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270 Concord Street
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Vocal Interface Div.
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Phone: (714) 557-9181

EUROPE
Vocal Interface Div.
Reis-Str. 16
6200 Wiesbaden
Federal Republic
Germany

VOCAL INTERFACE

A Division of Federal Screw Works

The Communications People

ANNEXES

ANNEXE I - Certaines considérations sur les types de dispositifs électroniques.

Nous avons cru nécessaire d'inclure en annexe, différents facteurs qui peuvent contribuer à établir un choix de divers dispositifs électroniques en tant qu'aides véritables à la communication pour une clientèle comme celle qui nous concerne.

Cette annexe comprend donc une identification de cette clientèle et de ses besoins, une énumération et une définition des modes de fonctionnement des dispositifs de "output", celles-ci étant accompagnées d'une brève appréciation de chacun des dispositifs. A ceci s'ajoute une énumération des critères nécessaires à l'élaboration d'un système idéal d'aide à la communication.

A - Clientèle

- Infirmes moteurs cérébraux
- Aphasiques
- Traumatisme crânien
- Laryngectomisés
- Quadriplégie traumatique sévère

B - Besoins prioritaires des I.M.C.

- Communication
- Activités de la vie quotidienne
- Mobilité
- Ambulation

C - Modes de fonctionnement des dispositifs électroniques

1 - **Balayage**: Le sujet sélectionne le caractère en réagissant au tableau.

- Balayage linéaire ex: aiguille rotative pour indiquer le caractère
- Balayage par rangée et colonne: une lumière se déplace à vitesse réglable sur le tableau
- Balayage dirigé ou le sujet choisit la direction lui-même; nord, sud, est, ouest ou diagonale
- Balayage anticipatoire (voir TIC)

Avantage: Peut être utilisé par à peu près n'importe quel sujet (un seul interrupteur)

Désavantage: lenteur d'opération

2 - **Encodage**: les caractères sont indiqués à l'aide d'un code préétabli

ex:

	1	2	3	4	5	6	7	8	9	10
1	a	b	c	d	e	f	g	h	i	j
2	k	l	m	n	o	p	q	r	s	t
3	u	v	w	x	y	z				

P = 26

= 38

Avantage: plus grande vitesse que le balayage

Désavantage:
- requiert un plus grand contrôle moteur
- un plus grand nombre d'interrupteurs
- plus de réponses par lettre, on doit apprendre le code.

3 - Sélection directe: les caractères désirés sont indiqués directement par le sujet

ex: dactylo

clavier agrandi pour dactylo

Autocom

Avantages: vitesse (possibilité de choisir individuellement sa propre vitesse) Facile à apprendre.

Désavantages: exige un plus grand contrôle moteur que pour le balayage ou l'encodage.

D - Dispositifs de "output":

1 - Visuel:

satisfait surtout les besoins élémentaires

lettres sur tableau magnétique

cadran indicateur

tableau de symboles Bliss

tableau dynamique alpha-numérique

écran de télévision qui permet l'impression du message.

2 - Imprimé (hard copy):

permet d'emmagasiner de l'information; une plus grande indépendance pour l'école, la maison et la correspondance.

ex: dactylo

bande imprimée.

3 - Vocal:

permet une participation de groupe dans la classe;

permet l'usage du téléphone, etc.

ex: synthétiseur de parole (VOTRAX).

E - Système idéal d'aide à la communication

Ce système requerrait:

- un choix de modes de sélection (balayage, encodage, sélection directe) s'adaptant facilement aux besoins individuels.
- une capacité d'emmagasiner suffisamment de vocabulaire ex: capacité de sélectionner des mots entiers, des phrases etc. permettant aussi un choix de vocabulaire s'adaptant aux besoins d'expression individuelle. (mémoire-voir item particularités du Autocom)
- une possibilité d'utilisation dans différents milieux (école, maison etc.), donc le système doit être portatif et doit demander peu d'installation.
- formes variées de output: copie imprimée télévision, synthétiseur de parole; possibilité d'usage avec un ordinateur ou avec un système de communication téléphonique.

ANNEXE II - Glossaire des systèmes de commande.

Ce glossaire est tiré de:

Holt C.S., Vanderheiden, C.C.,
Master Chart of Communication Aids,
Publication: Trace Center, 922 ERB,
1500 Johnson Drive,
University of Wisconsin,
Madison, Wisconsin, U.S.A.

GLOSSARY OF INPUT INTERFACES

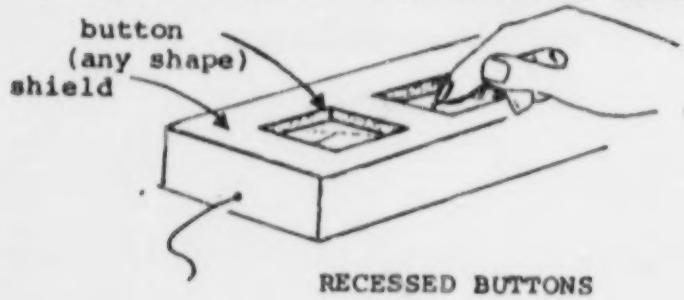
MECHANICAL SWITCHES FOR THE EXTREMITIES - fingers, hands, elbows, feet (Many can also be used with a headstick

Sub-types: h - intended for fingers or hands
f - intended for feet
t - intended for tongue

A. PUSH BUTTONS There is a very wide variety of shapes and sizes. Two special types are noted:

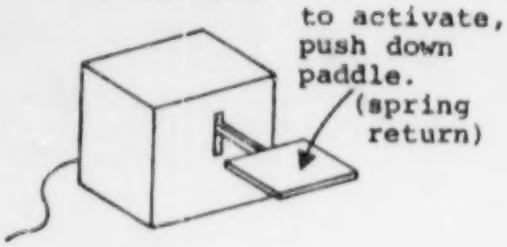
Ak - Keyboard-style buttons, similar to those found on an ordinary electric typewriter.

Ar - Recessed (shielded, guarde) buttons. The "shield" helps prevent accidental activation of buttons.

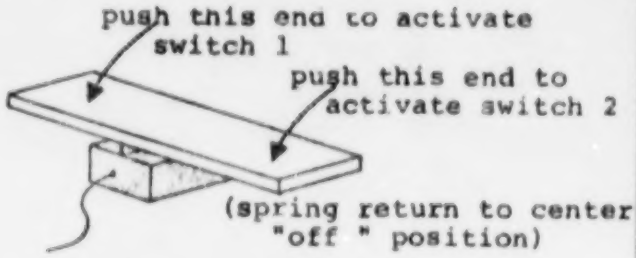


RECESSED BUTTONS

B. PADDLES AND LEVERS - There are many shapes and sizes. For example:



PADDLE SWITCH

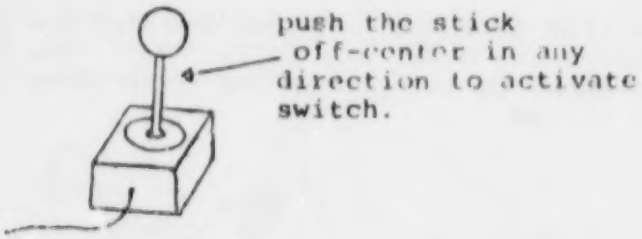


SEE-SAW ROCKING LEVER
(2 switches)

C. PILLOW SWITCH - Punch a "pillow" or pad to activate the switch.

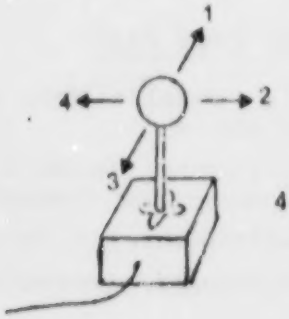
MECHANICAL SWITCHES FOR THE EXTREMITIES (cont.)

D. WOBBLESTICK - (Possum Controls Ltd.)



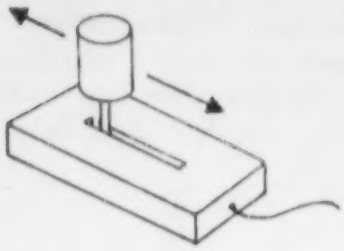
WOBBLESTICK

E. JOYSTICK - Multiple switches are operated by one control stick. In general, 2 to 8 switches are incorporated.

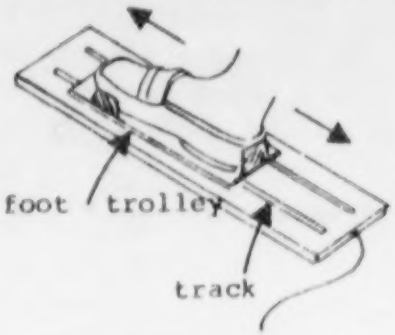


4-SWITCH JOYSTICK

F. SLIDING OR TROLLEY SWITCHES - Switching is accomplished by motion along a slide, groove, or track, These switches usually have 2 positions ("on" at one end, "off" at the other) or three positions (one switch at each end, "off" in the middle).



SLIDE SWITCH

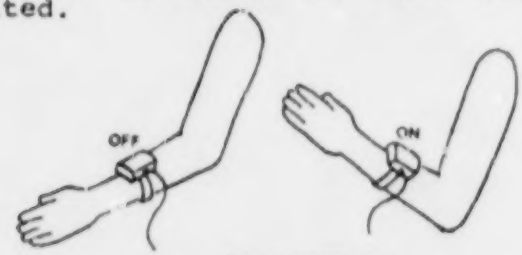


FOOT-TROLLEY SWITCH

G. POKE SWITCHES - Activate by poking a pointer in a hole or indentation (PMV "Minimum").

MECHANICAL SWITCHES FOR THE EXTREMITIES (cont.)

H. TIP OR TILT SWITCHES - Tilted one way the switch is "off", tilted the other way it is "on." The switch would be strapped to the arm or any other body part which can be tilted.



TIP SWITCH

MECHANICAL SWITCHES FOR A SPECIFIC BODY PART

K. These switches are fitted to a specific body part and are activated by a particular motion.

Ka - Head switch. Activate by lateral (side to side) head motion. ("Tic"- Tuft's Interactive Communicator)

Kc - Chin switch. Squeeze switch between chin and chest.

Ke - Eyebrow switch. Raise eyebrows. (Veteran's Administration, "speakeasy")

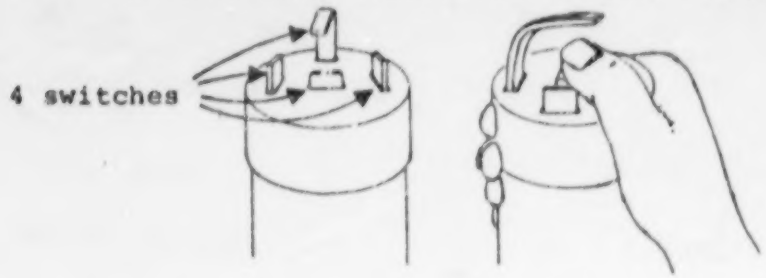
Kn - Knee switch.

Kp - Palate switch. Press toungue up against switch molded to fit in the palate.

Ks - Splint switches. Amolded hand splint with miniature paddle switches mounted above or below the fingers. (Possum Controls Ltd.)

Kt - Tongue switch-lever operated by the tongue.

Kv - Thumb switch. (Fairchild-Hiller, "Viewcom")

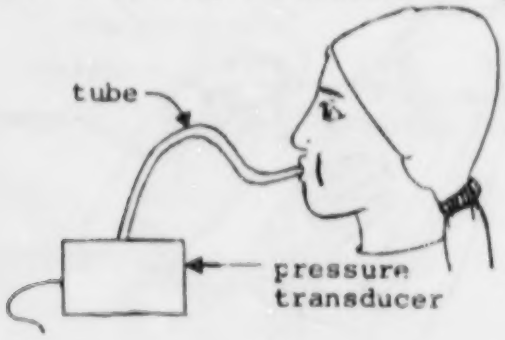


THUMB SWITCH

Kw - Wrist switch, Rotate wrist. ("Tic": Tuft's Interactive Communicator)

PNEUMATIC SWITCHES

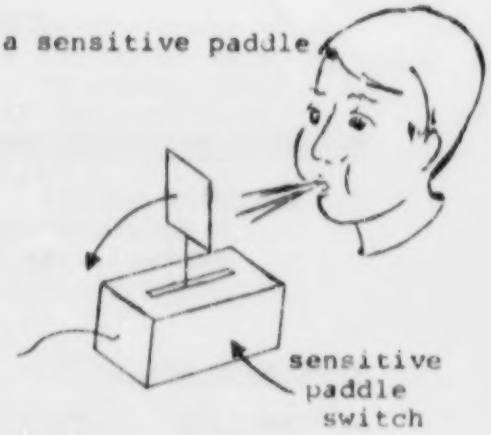
L. SUCK AND PUFF - The switch is operated by very small pressure changes in the tube. Mouth control rather than respiratory control, is usually sufficient to operate this switch.



SUCK AND PUFF SWITCH

M. AIR PADDLES - Activated by blowing at a sensitive paddle switch.

AIR PADDLE



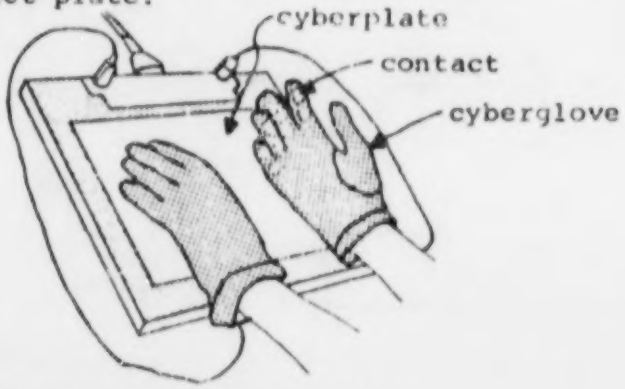
TOUCH SWITCHES - These require contact, but no physical pressure.

N. TOUCH-PLATE - Activated by touching a prescribed sensor area with any skin surface.

Nt - Designed for use with the tongue.

TOUCH SWITCHES (cont.)

P. CYBERGLOVE AND CYBERPLATE - (Cybernetics Research Institute) Gloves with contacts on the fingers are touched to a metal contact plate.



CYBERGLOVE AND CYBERPLATE

MOISTURE SENSITIVE SWITCHES

Q. MOISTURE SWITCH - Activated by contact with the tongue. A moisture sensitive switch will not be activated by contact with dry skin.

PROXIMITY SWITCHES

R. PROXIMITY SWITCH SENSITIVE TO BODY - Activated when a body part is brought within a certain range of the switch.

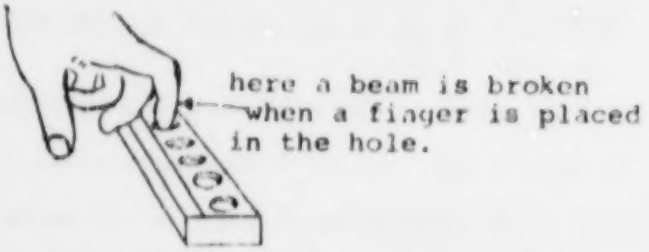
S. PROXIMITY SWITCH SENSITIVE TO A SPECIAL TRIGGER ELEMENT - Activated when a special object (metal, magnet, circuit, etc.) is brought within a certain range of the switch.

OPTICAL SWITCHES

T. LIGHTSPOT - The beam from a light source (attached to the head or some other body part) is used to operate photosensitive switches on a panel in front of the user. The user can see the lightspot on the panel and maneuver it to the desired photosensor.

OPTICAL SWITCHES (cont.)

U. INTERRUPTED-BEAM SWITCH - Activated whenever a beam of light is interrupted (by a finger or some other body part).



INTERRUPTED-BEAM SWITCH

SONIC SWITCHES - Activated by sound

X. WHISTLE SWITCH - The switch is activated by the sound of an ultrasonic dog whistle. The whistle can be blown by punching a rubber bulb connected to its mouthpiece. With this type of switch, no physical connection is needed between the user and the communication aid. ("Tic": Tufts Interactive Communicator)

BIOELECTRIC SWITCHES - Activated by the electrical impulses generated in nerves and muscles of the body.

Y. MYOELECTRIC SWITCH - Electrodes are applied to the skin near a controllable muscle group. Contraction of the produces electrical signals whech are detected by the electrodes and used to activate the switch.

ANNEXE III - Remarques concernant le congrès sur les aides techniques pour les handicapés tenu au Centre de Génie Biomédical de l'Université Tufts à Boston, les 10,11,12 juin 1976.

Les trois participantes concernées par le projet du B.R.O. ont assisté à cette conférence à Boston. Une journée et demie a été consacrée entièrement au problème de la communication non-verbale. Les autres présentations concernaient également notre clientèle mais dans d'autres domaines, quotidienne telle le positionnement, la mobilité, l'indépendance dans les activités de la vie.

La conférence était sous forme de présentations accompagnées très souvent de documents audio-visuels très complets. De plus, les manufacturiers présentaient dans une salle d'exposition différents appareils disponibles sur le marché.

Cette conférence a permis:

1- un échange interprofessionnel très enrichissant.

2- une clarification quant à l'élaboration de notre projet pour l'an prochain.

3- une analyse plus approfondie ainsi qu'une mise à jour de plusieurs appareils destinés à la communication; nous avons pu voir une démonstration des appareils que nous ne connaissions auparavant que par la lecture.

4- La découverte d'appareils qui nous étaient inconnus

5- une vue d'ensemble des réalisations technologiques actuelles dans ce domaine (de l'appareil le plus élémentaire au plus sophistiqué)

6- une réflexion à la suite d'une mise en commun:

a) des problèmes des différents centres de recherche

b) de leur mode d'approche

c) et de leur degré de succès

7- une appréciation de l'aide apportée au handicapé dans d'autres domaines ex: (mobilité, positionnement, aide aux thérapies) et suggère certaines applications à l'école

Nous avons pu à la suite de cette conférence nous ajuster aux réalités matérielles concernant les aides à la communication non-verbale et faire un choix d'appareils plus adéquat.

ANNEXE IV - Le projet Logo

Dans notre phase d'information sur les appareils électroniques et les aides mécanisées nous avons regardé du côté des ordinateurs.

Par l'intermédiaire de Monsieur G. Chevalier du Service Général des Moyens d'Enseignement nous avons rencontré Monsieur Guy Montpetit, psychologue et principal responsable du Projet Logo dans la région de Montréal.

Ce projet est relié à une vaste recherche du laboratoire d'Intelligence Artificielle du Massachusett Institute of Technology de Cambridge au Massachusett's. L'initiateur principal en est Seymour Papert.

Le projet vise à un renouvellement pédagogique, entre autre une nouvelle approche de l'enseignement des mathématiques. A l'aide de l'ordinateur, d'un télédactylo et d'un petit animal cybernitique, la "tortue", qui peut tracer des figures, avancer, reculer, circuler de tous les côtés, etc... l'enfant apprend à résoudre des problèmes mathématiques de façon concrète. Il arrive à s'impliquer véritablement, il devient mathématicien lui-même.

Bien que ce projet nous ait intéressés au plus haut point il n'a pas sa place dans cette première étape où nous recherchons avant tout des aides à la communication. Nous croyons cependant que dans une étape ultérieure, il y aura lieu d'ajouter à un appareil déjà choisi un output qui permette des utilisations pédagogiques de l'ordinateur.

BIBLIOGRAPHIE

Rapport de conférence

Foulds Richard A., Lund Brenda L. Editors
Proceedings 1976 Conference on Systems and Devices for the Desabled. Biomedical Engineering Center. Tufts New-England Medical Center, Boston, Mass.

Extraits de conférence

(1) Foulds, Richard, M. S., Gaddis, Carl, M. A.
"The Practical Application of an Electronic Communication Device in the Special Needs Classroom". Biomedical Center, Tufts, New-England Medical Center, Boston, Mass.

(2) Geisher, C. D., Vanderhe den, C., Volk, A.
"An alternate Interface to Computer for the Physically Handicapped: The Automonitoring Communication Board" National Computer Conference 1974, Madison, Wis. University of Madison, Wisconsin.

(3) Kates, Barbara, Sutherland, Dale.
"Consideration in Assessing a Child's Communication Needs". Ontario Crippled Children Center, Nov. 1975.

ARTICLES DE REVUES

(1) Bullock, Ann, Dalrymple, George F., Danca, Janice, M. "Communication and the non verbal", American Journal of Occupational Therapy, Vol. 29, No. 3 March 1975.

(2) Chapanis, Alphonse. "Interactive Human Communication Towards the Development of a conversational Computer", The Scientific American, March 1975.

(3) Charbonneau R. J., Roy, Orest, CNRC. "A communication System for the Handicapped". Medical Electronics Biological Engineering 3,427, 1965.

(4) Feallock, Barbara, "Communication for the Non Verbal Individual", American Journal of Occupational Therapy, XII, 2, 1958, Part I.

(5) Hagen, Chris, Porter, Wyne, Brink Joyce. "Non Verbal Communication and Alternate Mode of Communication for the Child with Severe Cerebral Palsy", Journal of Speach and Caring Disorders, XXXVIII, 4, 1973.

(6) McDonald, E. T., Schultz, Adeline. "Communication Board for Cerebral Palsied Children" Journal of Speech and Caring Disorder, XXXVIII, 1973

(7) Vanderheiden, DeBerah-Harris, Brown, Warren P., Reinen, Steve, MacKenzie, Paula, Scheibel Claudia. "Symbol Communication for the Mentally Handicapped", Mental Retardation, Vol. 13, No. 1, 1975.

(8) Waksvik-Hunsinger, Keila, Germain-Boucher, Monique. "Un Mode de Communication par symboles pour enfants I. M. C. privés de la parole (Système Bliss)" The Canadian Journal of Occupational Therapy, Spring 1976.

Extraits de rapport de recherche

(1) Goodenaugh, Cheryl.
"Un système de communication par des syllabes de la langue française à l'usage d'enfants atteints de paralysie cérébrale". Université du Québec à Montréal, département de linguistique 1975.

(2) Holts, C. S., VandeRheiden, C. C.,
Master Chart of Communication Aids, 922, E. R. B. 1500, Johnson Drive, University of Wisconsin, Madison, U. S. A.

(3) Kafafian, Haig
Study of Man Machine Communication Systems for the Handicaped. Cybernetic Research Institute, Washington, D. C., U. S. A.

Prospectus:

DUFCO. "Matrix Communicator"
Communication Aid for the Speechless
Dufresne A. F. Consulting Eng.
901, Iva Court, Cambria, Calif. 93428

"P. M. V. Systems"
Mid-Canada Medical Communication Aids
Mid-Canada Medical
1270 Cresttown Drive, Mississauga, Ont. L4W 1A6

"Bliss Symbol Scanner"
Prentke Romick Co.
Electronic Aids for the Severely Handicapped
Electronic Center, R. O. 2, Box 191, Shseve, Ohio 44676-5

"The Portable Auto Com. WordMaster"
Trace Research and Development Center for the Severely Communicatively Impaired a Portable Non-Verbal Communication Prothesis for the Severely Physically Handicapped, University of Wisconsin, Madison, Wisconsin, U. S. A.

"Votrax"
Multi-lingual Voice System
Vocal Interface Division
Federal Screw Works
500 Stephenson Highway, Troy, Michigan 48084